IRHS - Institut de recherche en horticulture et semences

Rapport Hcéres

agence d'évaluation de la recherche
et de l'enseignement supérieur

Section des Unités de recherche

AERES report on the research unit

Institut de Recherche en Horticulture et Semences

(IRHS)

Research Institute on Horticulture and Seeds (RIHS)

From the

University of Angers

INRA

Agrocampus Ouest

January 2011

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Le Président de l'AERES

Didier Houssin

Section des unités de recherche

Le Directeur

Pierre Glorieux

January 2011

Unit

Name of the unit : Research Institute on Horticulture and Seeds (RIHS)

Requested label : UMR_A INRA

Unit director : M. Jean-Pierre RENOU

Members of the expert committee

Committee chairman

M. Dominique JOB, CNRS Lyon

Other committee members

Mrs Fabienne BAILLIEUL, University of Reims Champagne-Ardenne

M. Mohammed BENDAHMANE, INRA Lyon

M. Jacques BOURGUIGNON, CEA Grenoble

Mrs Nicole COTTE-PATTAT, CNRS Lyon

M. Marc JULLIEN, AgroParisTech Versailles

Mrs Claire NEEMA, AgroParisTech Paris

Mrs Frédérique PELSY, INRA Colmar

M. Christophe ROTHAN, INRA Bordeaux

M. Ivan SACHE, INRA Grignon

Mrs Claire NEEMA, CNECA member

Observers present during the visit

Scientific delegate representing AERES

M. Jean-Loup NOTTEGHEM

University, School and Research organization representatives

M. Jean-Louis FERRIER, Université d'Angers

Mrs Emmanuelle CHEVASSUS, Agrocampus Ouest

M. Jean-Luc MAUGET, Agrocampus Ouest

Mrs Hélène LUCAS, INRA

M. Guy RICHARD, INRA

Mrs Nathalie MUGNIER-JOLLAIN, INRA

M. Frédéric GAYMARD, INRA

M. Thomas GOUJON, INRA

M. Olivier LE GALL, INRA

Report (IRHS/RIHS, novel Institute)

1a • Introduction

It is to be noted that the IRHS/RIHS (Institut de Recherche en Horticulture et Semences / Research Institute in Horticulture and Seeds) joint unit will be created, in 2012, from the merging of the four following joint units that associate INRA, University of Angers and Agrocampus Ouest: UMR SAGAH (UMR 0462; Sciences Agronomiques Appliquées à l'Horticulture / Agronomic sciences applied to Horticulture), UMR GenHort (UMR A1259; Génétique et Horticulture / Genetics and Horticulture), UMR PaVé (UMR A77; Pathologie Végétale / Plant Pathology) and UMR PMS (UMR 1191; Physiologie Moléculaire des Semences / Molecular Physiology of Seeds). Therefore, the evaluation of the IRHS/RIHS joint unit is presently considered within this future evolution. The present report will therefore be organized as follows:

- Global evaluation of the IRHS/RIHS joint unit (paragraphs 1a to 3a);

- Global evaluation of the UMR SAGAH (paragraphs 1b to 3b);

- Global evaluation of the UMR GenHort (paragraphs 1c to 3c);

- Global evaluation of the UMR PaVé (paragraphs 1d to 3d);

- Global evaluation of the UMR PMS (paragraphs 1e to 3e);

- Assessment of each of the novel teams proposing to work at the IRHS/RIHS Institute (Teams 1 to 12; paragraph 4).

• Date and conduct of the visit

The expert committee evaluated on 5-6 January 2011 the proposal of the creation of the novel IRHS/RIHS Institute, based upon the merging of the four founding UMRs, namely SAGAH, GenHort, PaVé and PMS. All committee members received all various documents (reports of the four founding joint research units; project of the IRHS/RIHS) about three weeks before the meeting. The meeting started as planned with a presentation of the committee and the evaluation procedure, and with a global presentation of the future Institute by its proposed director, Jean-Pierre RENOU, notably concerning the fields of activity, partnership, socioeconomic positioning, human resources, financial resources, scientific production, organization and structure (themes, teams, scientific animation), and the creation of the new building that will host the IHRS/RIHS. Philippe SIMONEAU, professor at the University of Angers, presented the aspects linked to teaching and training. Subsequently, each new IRHS/RIHS team presented its past activities (within the period 2006-2011) and future projects (within the period 2012-2016), followed by a discussion with the committee. Within this evaluation, the committee also met, in separate meetings, with the different personnels working at IRHS/RIHS, namely researchers and teachers-cum-researchers, PhD students and postdoctoral fellows, and the technical and administrative staff. The committee also met with representatives of the parent organizations, namely Angers University, INRA, and Agrocampus Ouest. A final meeting was held with the future director of the IRHS/RIHS, the direction team and the heads of the future teams of the Institute. The site visit ended with the closed-door meeting of the committee.

- History and geographical location of the unit and brief description of its field of study and activities

The Institute will result, in 2012, from the merging of the four former joint research units, namely UMR SAGAH, UMR GenHort, UMR PaVé and UMR PMS, under the auspices of INRA, Agrocampus Ouest and University of Angers. On this basis, the Institute will gather 188 staff members (152 permanent staff including 58 scientists, 94 engineers, technicians and administrative staff), from INRA (54%), Angers University (25%), and Agrocampus Ouest (21%). At present, these Units are located at different sites (University, Agrocampus Ouest and INRA). It is already agreed that a new building « Institut du Végétal / Plant Institute » will be created on the INRA campus in Angers (Beaucouzé) to host all the teams proposing to work within the IRHS/RIHS. However this building will not be delivered presumably before 2014. Accordingly, the IRHS/RIHS research teams will remain on separate sites until delivery of this new building. Based on the experience of the four founding joint units, the ambition of the Institute is to create an optimized structure to conduct leading edge and strategic research toward understanding and exploitation of horticulture products and seeds, with special emphasis on the integration of new genomics and post-genomics approaches to address the challenges of food safety, quality and production of plant products in a sustainable manner. Also, along with the ambition to become an excellence research centre, the Institute is expected to become a main driving force for the Végépolys competiveness cluster. The Institute will also be, together with other joint units from Angers and Nantes, part of the "Structure Fédérative de Recherche/Federative Structure of Research" (SFR) named "QUASAV" (Qualité et Santé du Végétal / Plant Quality and Health; formerly IFR 149, whose 2008-2010 activities and project were evaluated on 7 January 2011 by a subset of the present evaluation committee). Finally this Institute will be a driving force for teaching and training in plant sciences.

- Management team

Jean-Pierre Renou will direct the Research Institute, being assisted by a Steering committee composed of himself, three deputy directors (Mathilde BRIARD, Charles MANCEAU and Philippe SIMONEAU), three team and sector representatives (François LAURENS, Olivier LEPRINCE, and Soulaiman SAKR) and a scientist in charge of scientific animation (David MACHEREL).

- Staff members

	FUTURE
N1: Number of professors (see Form 2.1 of the unit's dossier)	43
N2: Number of EPST, (Public scientific and technological institution) or EPIC, (Public industrial and commercial institution) researchers (see Form 2.3 of the unit's dossier)	13
N3: Number of other professors and researchers (see Form 2.2 and 2.4 of the unit's dossier)	2
N4: Number of engineers, technicians and tenured administrative staff members (see Form 2.5 of the unit's dossier)	93.5
N5: Number of engineers, technicians and non-tenured administrative staff members (see Form 2.6 of the unit's dossier)	12
N6: Number of doctoral students (see Form 2.7 of the unit's project dossier)	24
N7: Number of persons accredited to supervise research	28

2a • Assessment of the unit

• Overall opinion

Based on the reports provided by the four founding research units, the research carried out at the Institute can be qualified as good to excellent. This is testified by excellent publications *in Science, Nature Genetics, Current Biology, Plant Cell, Molecular Ecology, Plant Journal, Plant Physiology, New Phytologist, Nucleic Acids Research, Plant Cell and Environment, Molecular Plant-Microbe Interactions, PLoS One, Theoretical and Applied Genetics*, as well as by the creation of a number of new plants, both in fruit trees and ornamental plants, some of them are already on the market as for example the Ariane apple. Owing to the merging of the four founding former joint units, the Institute will be clearly visible in the French and international research landscape both in horticulture and seeds. However, the committee noticed heterogeneity in the performances of the various proposed teams, such that the quality and originality of the research, as well as that of the project, of some of these teams were clearly of high international standard, while others were less performing. Another question deals with the different levels of funding that the various teams can attract. Overall, the unit teams have been quite successful in grant applications, given the EU FP7, ANR (French National Research Funding Agency), Ministry of Agriculture and regional granted contracts. The director and the staff scientists of the Institute propose a project for the next term with some (albeit apparently slight) adjustments compared to the organization within the former joint units, notably in the composition of the new teams. An organization in four scientific themes (Architecture and product quality; Knowledge and exploitation of genetic diversity; Plant-pathogen interactions; Seed, stress and environment) and 12 teams (see paragraph 4) is proposed for the forthcoming five-year period. There is a large heterogeneity in the size of the proposed teams, ranging from 25 to as little as to 6 members, notably concerning the technical support allocated to them. This is particularly acute as some of the smallest teams are entirely composed of professors and assistant professors with heavy teaching duties.

• Strengths and opportunities

Globally, this Institute will clearly become a centre of excellence concerning teaching, research and the training of PhD students in horticulture, plant pathogen interactions and seed science. This is supported by the following facts:

- One hundred and twenty-two Master 2 students and 61 PhD students were trained during the last 2006-2010 period, testifying to the dynamism/attractiveness of the founding joint research units.

- The four founding joint units produced 168 publications in journals with good to high visibility and a number of varieties/cultivars and patents.

- Their teams have international reputation in the fields of horticulture, phytopathogenic organisms and seeds. They gather research groups that are world leaders on these topics. The creation of the IRHS/RIHS Institute will, by increasing scientific synergy, favor an even better scientific perspective and strengthen/enhance the international position of the new teams.

- The large variety of approaches used, ranging from ecophysiology and modeling to molecular and quantitative genetics, biochemistry, biophysics, cell biology, population genetics and genomics really makes the IRHS/RIHS an expert integrative biology research unit in plant sciences.

- Some teams have established strong cooperation at the international level (e.g., apple genomics, seed genomics, phytopathogens; Teams 3, 4, 5, 7, 9, 10). Particularly interesting is the association between one team of the new Institute (Team 11) with SNES/GEVES providing opportunities to develop high-throughput seed phenotyping and technological transfer to the seed industry. Also, it is worth mentioning the management of the French collection of phytopathogens (Team 7), and of original plant genetic resources (Teams 3 and 4), all of which are very well integrated within regional, national and international activities.

The excellent quality of the proposed management is instrumental toward the future organization of the IRHS/RIHS Institute. It is clearly apparent that the action of the new director of this Institute has favored an excellent working atmosphere, resulting in large agreement of staff members to the proposed creation of such an Institute.

The IRHS/RIHS Institute will benefit from the support of performant facilities to be developed in the new building (greenhouses) or already existing from the QUASAV SFR (platforms for nucleic acids sequencing, imaging, metabolite profiling, collections of phytopathogens, greenhouses, plant and seed phenotyping).

The creation of the IRHS/RIHS Institute will facilitate the relations with steering authorities and funding organizations. As mentioned above, this Institute will be located in the new building Institut du Végétal / Plant Institute, which will also host different groups in the plant sector still located in various sites in Angers.

- ## Weaknesses and threats

The major threat stays in the geographical dispersion and in the fact that the new building is not expected before 2014.

Despite clear efforts in the reorganization of teams from the founding research units, the organization proposed in the new Institute would appear as a mere transposition of what existed in the previous four founding research units. The four founding joint research units globally included 11 teams, which can be compared to the novel 12 proposed teams. Although at present, the progress made toward the creation of the Institute is remarkable, more efforts are still required to better integrate the Institute teams within clear projects visible at national and international levels. The evaluation committee is fully aware that this is a hot topic. However, the committee strongly encourages the director and the new team leaders to strengthen the interactions between the proposed teams and to favor the emergence of joint projects (e.g., co-direction of PhD students). For example, the interaction between Teams 1 and 2 shall be reinforced, with maybe the objective of merging these two teams on a single plant/rose architecture team. Another example concerns Teams 7 to 12, all sharing the seed as a working model. Besides these examples there might be other opportunities.

The discussion with the technical and administrative staff revealed the existence of potential conflicting situations as to their recognition in terms of published papers, scientific presentations (oral and posters) as well as consultation on the progress of research projects and on the creation of the novel Institute. They also stressed the need of a clear strategy for their evaluation and career advancement.

Also, the discussion with the PhD students revealed, quite surprisingly, that no more than half of them would be interested to pursue a career in research.

- ## Recommendations for the unit director

<u>General statement:</u>

The commission feels that the number of teams (12) and their heterogeneity in size might decrease the visibility and working efficiency of the future Institute. However, the quality and homogeneity of the presentations made during the visit demonstrate that the teams have already made a collective foreseeing effort. The commission would like to encourage further discussions about the reorganization of the Institute and possible team merging; the discussions, which will be facilitated by the relocation of all teams in the same building, should be organized under the guidance of the director of the unit.

<u>Specific points:</u>

It is recommended to the head of the Institute to:

- favor/strengthen cooperation between the teams (eg., horticulture vs pathogens vs seeds);

- assist the weaker teams in their effort to improve their scientific level;

- pursue efforts toward finding the best participation/repartition of the technical staff to the work of the proposed research teams and technical platforms;

- implement a dynamic scientific animation to maintain / strengthen links between geographically dispersed teams, particularly in the first years of the new contract;

- encourage some researchers to publish more and better, and to be active in fund raising;

- improve the international visibility of the Institute;

set up an efficient administrative team to the benefit of the whole Institute and teams;

- stimulate discussions toward a better participation of all staff members to guarantee the success of the teams;

- start a general discussion about mathematical modeling, bioinformatics, high-throughput data treatment, in close partnership with the University of Angers;

- develop quality management procedures;

- remain vigilant to the progression of the new building housing the Institute and common facilities (eg., greenhouses);

- consolidate the position of the Institute within the socioeconomic context.

- Production data

(cf. http://www.aeres-evaluation.fr/IMG/pdf/Criteres_Identification_Ensgts-Chercheurs.pdf)

A1: Number of produisants (professors and researchers whose names appear in a minimum number of "publications" over a 4- year period) as listed in N1 and N2 in the project column	51
A2: Number of produisants among the other staff listed in N3, N4 and N5 in the project column	12
A3: Proportion of produisants in the unit [A1/(N1+N2)]	0.91
A4: Number of theses for accreditation (HDR) to supervise research defended	9
A5: Number of PhD theses defended	24

3 a • Specific comments on the research unit

- Appreciation on the results

— Pertinence and originality of the research, quality and impact of the results

The joint research units forming the new IRHS/RIHS Institute have a long lasting experience in horticulture and seeds. This is attested by the publications, patents and new varieties issued from the work of these groups during the last four years.

— Number and quality of the publications, scientific communications, thesis and other productions

In total 168 papers have been published in highly relevant journals. Furthermore there was a substantial number of creations of new plant varieties, greater than 15. The four founding joint units trained 61 PhD students and 122 Master students.

— Quality and stability of partnerships

Many partnerships of high quality do exist, first between the parent organizations, and second at national and international levels.

- Appreciation on the impact, the attractiveness of the research unit and of the quality of its links with international, national and local partners

— Number and reputation of the awards obtained by staff members, including invitations to international conferences and symposia

Team members were invited speakers in 24 national and international meetings (GenHort: 8; PMS: 7; PaVé: 5, SAGAH: 4). They are associate Editors and/or members of Editorial Boards of several journals (*Journal of Horticultural Science & Biotechnology, European Journal of Plant Pathology, Phytopathologia mediterranea, Seed Science Research*). Globally they organized nine meetings (GenHort: 4; PaVé: 4; PMS: 1).

— Hability to recruit high level scientists, post-docs and students, particularly from abroad

Globally the four funding units have over the 2006-2011 period recruited 13 professors and assistant professors, two INRA researchers, and 32 engineers, technician and administrative staff members, corresponding to 31% of the total number of present permanent positions.

— Hability to raise funds, to successfully apply for competitive funding, and to participate to the elaboration of call for projects and to the activity of competitiveness clusters

This is quite variable amongst teams. Some of them are excellent (eg., participate to the coordination of EU FP7 projects, of national ANR or regional projects), while others are less performing. The Végépolys competitiveness cluster has supported several regional projects.

— Participation to international or national scientific networks, existence of stable collaborations with foreign partners

There are several indications of the existence of active participation to international or national scientific networks, for example, the French collection of phytopathogens or the French network on seeds. Many collaboration programs with foreign partners do exist as attested by achieved publications.

— Valorization of research results and establishment of socioeconomic or cultural partnership

Several plant varieties/cultivars have been released (ornamental, fruit trees). On seeds the work done during the last years allowed setting up a high-throughput phenotyping system for germination and seedling vigor, which should find applications in the seed industry toward optimizing the quality of commercial seedlots. This system is also used to support other projects of the Institute necessitating high-throughput phenotyping and/or modeling (e.g., plant architecture, plant diseases).

- Appreciation on the strategy, management and life of the research unit

Considering the clear and very positive position of the parent organizations, there is wide interest in the creation of the Institute. Furthermore, staff members generally agree about the idea of merging the four joint units toward this aim. However, this endeavor has also created some concern about the future among some members of the Institute.

— Contribution of the research unit staff members to teaching and to the structuration of the research at the local level

A large part of the scientists (63%) are professors or associate professors.

Globally the teaching implication accounts for about 9,500 hours per year, mainly at University of Angers and Agrocampus Ouest.

There is a strong involvement of staff members in the management of educational programs with the direction or co-direction of one Educational department (Biology), four Master degrees, one international Master degree, nine Bachelor degrees, and one associative Learning Centre. Staff members are also involved in several pedagogic and managing committees (e.g., the Doctoral Scholl Venam and the Master BioVGPA).

Concerning the structuration of research, the IRHS/RIHS is a main member of the SFR QUASAV, which federates more than 90% of the regional potential in plant science research (bringing together 361 people including 136 scientists and 61 PhD students).

- Appreciation on the project

— Existence, relevance and feasibility of a long term (5 years) scientific project

The project is globally excellent and no difficulties are anticipated here. The project will built in part on the strong experience of the four founding research units and also, under the impetus of the new Institute Head, on the availability of novel genomic tools notably in fruit trees and ornamentals like rose.

— Existence and relevance of a policy for the allocation of resources

Such policy does exist and has been presented by the future Institute Head. Concerning human resources adjustments would be needed, notably concerning the technical support allocated to some of the research teams of the Institute.

— Originality and existence of cutting edge projects

There is a good balance between currently productive and cutting edge projects.

Report (UMR 0462 SAGAH)

1b • Introduction

- Date and conduct of the visit

See paragraph 1a; report IRHS/RIHS.

- History and geographical location of the unit and brief description of its field of study and activities

The UMR SAGAH is a joint research unit that was created in 2000 and has evolved through intensive restructuration in response to criticisms made at previous evaluations. Following the recommendations by the INRA-EA (Environment and Agronomy) division given in 2003, the group was encouraged to explore plant-environment relationships and morphogenesis, with the aim of improving aesthetic quality of ornamental plants by using the rose as a model of ornamental bush. The mid-term evaluation of the SAGAH unit by the INRA-EA division in December 2008 acknowledged progress of the unit and further encouraged the laboratory to develop tight collaboration with the GenHort unit. Presently, the UMR SAGAH is engaged in a unique, structured scientific program investigating the determinism and development of the architecture of the rose with light as a selected environmental factor, notably at the level of branching and bud burst. These objectives fit into the framework of subject area 2 of the INRA EA division entitled "Modeling of plants and of the plant-genotypes interactions". The unit is composed of 13 researchers and 11 technical staff members. It is distributed on three sites: Angers University, Agrocampus Ouest and INRA campus.

- Management team

During the last two years, the research unit was headed by Vincent GUERIN (INRA) as director and Nathalie LEDUC (University of Angers) as deputy director, with Soulaiman SAKR (Agrocampus Ouest) as scientific coordinator.

- Staff members

	PAST	FUTURE
N1: Number of professors (see Form 2.1 of the unit's dossier)	7	Not relevant
N2: Number of EPST, (Public scientific and technological institution) or EPIC, (Public industrial and commercial institution) researchers (see Form 2.3 of the unit's dossier)	2	Not relevant
N3: Number of other professors and researchers (see Form 2.2 and 2.4 of the unit's dossier)	0	Not relevant
N4: Number of engineers, technicians and tenured administrative staff members (see Form 2.5 of the unit's dossier)	14	Not relevant
N5: Number of engineers, technicians and non-tenured administrative staff members (see Form 2.6 of the unit's dossier)	0	Not relevant
N6: Number of doctoral students (see Form 2.7 of the unit's project dossier)	6	Not relevant
N7: Number of persons accredited to supervise research	3	Not relevant

2b • Assessment of the unit

- Overall opinion

During the past few years the group has progressed in its reorganization, although some aspects still require improvement. The objective of the group was to obtain and integrate data toward predicting the response of plant architecture to environmental conditions (nitrogen treatment, cold temperatures, light) both at the plant and genotype levels, using rose as a model system. Good data have been obtained in this direction. For example (i) the group developed a method based on plant morphological visual descriptors and conditions to evaluate plant quality (sensorial analyses); (ii) they showed the absolute requirement of light for bud burst in rose (conversely to other plants; for example *Arabidopsis*, poplar) and studied the role of soluble sugars (metabolism and transport) and of two phytohormones (gibberellins and strigolactone) in this process; (iii) they initiated studies to address underlying molecular mechanisms by using gene candidate and transcriptome analyses approaches (AFLP-DD, EST); (iv) they started to develop a structural-functional model to predict the impact of environmental conditions on the architecture of the rose bush (that is, toward the Virtual Plant).

- Strengths and opportunities

This is a fairly large unit, with staff members comprising 13 researchers and a technical staff of 11 members from the various bodies to which the unit is affiliated: 11 INRA, eight Angers University and five Agrocampus Ouest. The size of the team even increased during the last quadrennial by the recruitment of two professors, one INRA researcher, two assistant professors and three technicians. Among them, a researcher in modeling has been recruited in 2009.

The unit staff shows complementary skills that cover the panel of technical and fundamental approaches used. It includes modeling (system biology approach), plant physiology and molecular biology approaches.

The thematic and geographic proximity with the GDO (Genetic determinism and diversity in ornamentals) team (team leader Fabrice Foucher), working on genetic aspects of rose flowering (see paragraph 4) will constitute a strong pole dedicated to rose bush, which will strengthen the links with the professional sector and international scientific teams in this sector.

Several platforms and greenhouse facilities are available to observe the effect of light and phytohormones on organogenesis and development of the rose bush.

- Weaknesses and threats

The unit is currently distributed into three geographically separated sites (INRA, Angers University and Agrocampus Ouest) but this problem should be solved by the building of the Institut du Végétal / Plant Institute that will house the entire unit on a single site and other teams of IRHS as well.

All scientific efforts are not focused on the rose as testified by the publications of the team and international collaborations involving other species than rose.

- Recommendations for the unit director

Not relevant.

- Production data

(cf. http://www.aeres-evaluation.fr/IMG/pdf/Criteres_Identification_Ensgts-Chercheurs.pdf)

A1: Number of produisants (professors and researchers whose names appear in a minimum number of "publications" over a 4-year period) as listed in N1 and N2 in the project column	9
A2: Number of produisants among the other staff listed in N3, N4 and N5 in the project column	2
A3: Proportion of produisants in the unit [A1/(N1+N2)]	1
A4: Number of theses for accreditation (HDR) to supervise research defended	2
A5: Number of PhD theses defended	2

3 b • Specific comments on the research unit

- Appreciation on the results

— Pertinence and originality of the research, quality and impact of the results

Between 2006 and 2010, the team had a good publication track record although the committee notes that publications on the rose model were in the minority. However, on this model system, very recent results seem promising, particularly concerning the role of soluble sugars, light and phytohormones in bud burst and their impact on branching and plant architecture.

— Number and quality of the publications, scientific communications, thesis and other productions

The publication record of the group is good with 29 published papers in good to excellent journals. However, among the 29 peer-review publications only five are on the rose projects. The other publications concern different species (five publications on rubber tree, three on walnut and three on hydrangea). It seems that the only post-doc who worked on a modeling project on rose has no publication. For the papers on the rose system, two of them (ACL7, Girault et al., 2008; ACL19, Girault et al., 2010) deal with sugar and light control of bud burst in rose and have been published in *Plant Cell and Environment* (IF 5.08). Two other papers (ACL4 and ACL5), published in 2009 and 2010, concern the visual descriptors and the sensorial analyses. Therefore, this makes clear that the team is successful in publishing on its new research topics. However, considering the number of scientists (10) and the 15 papers directly related to the activity of the SAGAH unit, the average ratio of papers/scientists (1.5) appears too small, even considering that seven out of the ten scientists are teachers. Members of the group have participated in several national and international meetings.

— Quality and stability of partnerships

The report indicates collaborations at both national, European and international levels. Yet it is difficult from the report to analyse whether this led to the mounting of projects in response to calls for projects and/or publications co-authored by the SAGAH team and the mentioned foreign laboratories.

- Appreciation on the impact, the attractiveness of the research unit and of the quality of its links with international, national and local partners

  — Number and reputation of the awards obtained by staff members, including invitations to international conferences and symposia

Four invitations in national and international symposium are recorded.

  — Hability to recruit high level scientists, post-docs and students, particularly from abroad

The unit was not very active in attracting PhD students and post-docs, especially taking into account that only three researchers are accredited to supervise PhD students (HDR). Here again among the three PhD students only one was working on the rose. In contrast, the unit proved quite efficient in terms of recruitment of permanent positions with two professors, two assistant professors, one INRA researcher and one technical support agent.

  — Hability to raise funds, to successfully apply for competitive funding, and to participate to the elaboration of call for projects and to the activity of competitiveness clusters

The group was not very successful in raising funds. Most of their grants were from regional supports. Although this is a good performance, the lack of grants at national and international levels might reflect a weakness in the competitively/visibility of the team.

The group has established a number of collaborations both at the national and the international levels. However, there is no clear scientific collaboration strategy on the ongoing rose projects both at the national and the international levels.

  — Valorization of research results and establishment of socioeconomic or cultural partnership

The report says that the team only had poor interactions with the competitiveness cluster Végépolys.

- Appreciation on the strategy, management and life of the research unit

The scientific animation was efficient as evaluated from the successful launching of the new research areas.

Seven out of the ten scientists are professors or assistant professors, and therefore have heavy teaching duties. Moreover, the unit has trained nine Master-2 students between 2006 and 2010.

- Appreciation on the project

See paragraph 4.

Report (UMR A1259 GenHort)

1c • Introduction

- Date and conduct of the visit

See paragraph 1a; report IRHS/RIHS.

- History and geographical location of the unit and brief description of its field of study and activities

The Laboratory "GENétique et HORTiculture" (GenHort; UMR A1259) is a joint research unit that was created in 2004 between the University of Angers, INRA and the formerly Institut National d'Horticulture (now Agrocampus Ouest) to gather research done in Angers on the genetics of horticultural species. GenHort comprises 68 permanent staff (~100 including permanent plus non-permanent people) and is localized at two locations: INRA Angers and Agrocampus Ouest. This unit has been under the heading of Elisabeth Chevreau for the past four years and is currently organized in three teams working on fruit, flower and vegetable: pip fruits (apple, pear), woody ornamentals (rose, Hydrangea, Genisteae) and carrot. In parallel, GenHort is organized in working groups on three research themes, namely (1) "Understanding, preserving and using the genetic diversity of horticultural plants", (2) "Understanding the genetic, molecular and ecophysiological determinants of horticultural traits" and (3) "Breeding methodologies and creation of new cultivars". GenHort has strong links with an Experimental Unit (~20 INRA GAP department permanent staff) that holds valuable genetic resources (ornamentals and pip fruits) on two locations (~90 ha in total).

Research activities concern both basic science projects on ornamentals (mainly rose), pip fruits (mainly apple) and vegetable (carrot), and more finalized research that resulted in the creation of new ornamental (six varieties released) and apple cultivars (six EC Plant variety rights (PVRs) granted, two varieties released) in the last four years. Basic science projects on pip fruits are focused on their genetic diversity (INRA holds a Genetic Resource Center on apple and pear with ~9,400 accessions) and on two traits of major importance (i) fruit quality, in particular apple texture and (ii) disease resistance, mostly scab and fire blight. Research on ornamentals is focused chiefly on gardening rose architecture and flowering, in parallel with analysis of genetic diversity of Hydrangea and Rosa, Pelargonium (genetic resources) and cryopreservation of meristems. Carrot research is focused on disease resistance to Alternaria dauci and genetic diversity of carotenoid accumulation in the root.

- Management team

Elizabeth CHEVREAU heads the GenHort unit. The six leaders of the teams and scientific axes (see above), together with a representative of Agrocampus Ouest, form the steering committee of GenHort joint research unit that meets once a month to discuss all aspects of the practical and scientific life of the unit and to make the necessary decisions. The direction of GenHort unit also receives advice on policy and management from an advisory board of 20 elected representatives of all categories of personnel and institutions of the unit, which meets three times a year. This mode of management proved essential to the coherence of the unit.

- Staff members

	PAST	FUTURE
N1: Number of professors (see Form 2.1 of the unit's dossier)	15	Not relevant
N2: Number of EPST, (Public scientific and technological institution) or EPIC, (Public industrial and commercial institution) researchers (see Form 2.3 of the unit's dossier)	4	Not relevant
N3: Number of other professors and researchers (see Form 2.2 and 2.4 of the unit's dossier)	2	Not relevant
N4: Number of engineers, technicians and tenured administrative staff members (see Form 2.5 of the unit's dossier)	49	Not relevant
N5: Number of engineers, technicians and non-tenured administrative staff members (see Form 2.6 of the unit's dossier)	6	Not relevant
N6: Number of doctoral students (see Form 2.7 of the unit's project dossier)	10	Not relevant
N7: Number of persons accredited to supervise research	9	Not relevant

2c • Assessment of the unit

- Overall opinion

GenHort is mainly organized as industry-driven research groups working on woody ornamental plants, pip fruits and carrot. In the past years, a considerable effort has been made to organize the research along three objectives common to all groups, which are focused on genetic diversity, understanding of the mechanisms controlling horticultural traits and breeding (methodology, creation of new varieties). Thanks to these efforts of structuration of the research activity, to the existence of strong experimental units and to the development of durable links with nurserymen and industry, including the competitiveness cluster Végépolys localized in Angers, GenHort has been quite successful in applied science and transfer to the industry, with the creation of new varieties for woody ornamentals (ten new varieties protected, six varieties released) and apple (six varieties protected by EC PVRs, two varieties released).

Publications (54 between 2006 and 2010) are mostly in the field of horticultural sciences and applied genetics (*Theoretical and Applied Genetics, Tree Genetics and Genome, Genome, Journal of Horticultural science and Biotechnology*, 0.86<IF<3.5) where they are considered as good/excellent. This good to excellent activity is witnessed by the central position of GenHort in several French and European networks and projects on genetic diversity (woody ornamentals, pip fruits), horticultural traits and breeding, and by its participation in large consortia. This includes the coordination of several projects among which large European projects. There is however still a large heterogeneity between the teams depending on team age, past activity and experience of senior scientists, and industrial and scientific context of the species studied. Owing to the past and current activity of scientists working on pip fruits, GenHort plays clearly a leading role in Europe on apple and related species. The Woody ornamental group has made an important (and ongoing) work to focus its activities on clearly defined research topics (plant architecture and flowering), mostly on rose where it plays a major role at national level, is implied in international consortium and has recently obtained original results. As in pip fruit team, carrot team studies are driven by the species studied and focus on both quality and resistance to pathogens. However, though carrot is clearly a major target at regional and French levels, this team may suffer from its relatively small size considering the diversity of its objectives and from the lack of large worldwide consortium on this plant species/topics. Furthermore the activity of this team is split between two seemingly different activities: carrot quality (carotenoids) and disease control.

- Strengths and opportunities

- GenHort constitutes a unique cluster of teams specialized on several species or group of species in plant horticulture, encompassing several fields of research (mostly genetics, ecophysiology, pathology) and tools (in vitro culture, genetic transformation etc…). The strong implication of teachers-cum-researchers from Agrocampus Ouest and University of Angers in the unit ensures the connection between research and teaching, which beneficiates to both the research groups (masters, PhDs) and to the students.

- In addition, GenHort has strong assets that make it very attractive at national and international levels, now that whole genome sequencing data are already available (apple) or will be soon available (rose, carrot in the future): (i) large genetic resources that are being characterized at genetic and phenotypic levels, including the association between candidate genes and horticultural traits, (ii) access to large (surface, manpower) experimental units, and (iii) strong relationships with industrial partners (nurserymen, competitiveness cluster Végépolys).

- As a consequence, GenHort has access to the funding necessary to secure its research programs.

- The new perspectives offered by the access to whole plant genomes will also offer the opportunity to GenHort to reduce its efforts on the development of tools and methodologies and therefore to put the emphasis on (i) the analysis of genetic diversity and (ii), the functional validation of target genes.

- The future constitution of the very large IRHS/RIHS unit localized in one unique location and its inclusion into the SFR QUASAV should contribute to strengthen the methodological and scientific interactions with teams working in various joint research units integrated into the proposed IRHS/RIHS joint unit (e.g. carrot team –pathology- with PaVé; development of plant physiology approaches with PMS etc…).

- Weaknesses and threats

- The large proportion of professors and assistant professors compared to INRA scientists, meaning a heavy teaching duty.

- Projects from GenHort that are driven by the industry are focused on applied science while scientific activity of scientists is mostly estimated through publication records. Though most journals in which GenHort is publishing are considered high with INRA standards, GenHort has the potential to and should reach more general and higher ranked journals, to compare/compete with other groups working on same species worldwide.

In contrary, if efforts are too focused on one species (e.g. rose for ornamental plants) or academic results, which can be effort- and time-consuming, the creation of new varieties and links with industry may suffer.

- Recommendations for the unit director

Not relevant.

- Production data

(cf. http://www.aeres-evaluation.fr/IMG/pdf/Criteres_Identification_Ensgts-Chercheurs.pdf)

A1: Number of produisants (professors and researchers whose names appear in a minimum number of “publications” over a 4-year period) as listed in N1 and N2 in the project column	16
A2: Number of produisants among the other staff listed in N3, N4 and N5 in the project column	5
A3: Proportion of produisants in the unit [A1/(N1+N2)]	0.84
A4: Number of theses for accreditation (HDR) to supervise research defended	1
A5: Number of PhD theses defended	5

3 c • Specific comments on the research unit

- Appreciation on the results

  — Pertinence and originality of the research, quality and impact of the results

GenHort studies are focused on several horticultural species. In this context, most of the research projects are pertinent with regards to the industrial requirements and with current studies done at national and international levels (architecture in ornamental plants, flowering in rose, fruit texture and disease resistance in apple, disease resistance and color/carotenoids in carrot).

  — Number and quality of the publications, scientific communications, thesis and other productions

Publications (54 between 2006 and 2010) are mostly in the field of horticultural sciences and applied genetics (*Theoretical and Applied Genetics, Tree Genetics and Genome, Genome, Journal of Horticultural Science and Biotechnology*, 0.86<IF<3.5) in which they are considered as good/excellent according to INRA. During the period considered, one HDR (Habilitation à Diriger des Recherches / Accreditation to direct research) and five PhD theses have been defended and the results published in international peer-reviewed publications.

  — Quality and stability of partnerships

GenHort has since a long time established stable and strong partnerships with the industrial end-users of its research as well as with research group (networks, French and European projects, consortia). New partnerships are currently being developed on several topics (e.g. rose, apple fruit ecophysiology etc …).

- Appreciation on the impact, the attractiveness of the research unit and of the quality of its links with international, national and local partners

  — Number and reputation of the awards obtained by staff members, including invitations to international conferences and symposia

Team members totalize four invitations to international conferences.

  — Hability to recruit high level scientists, post-docs and students, particularly from abroad

The GenHort unit was quite performant with the recruitments since 2006 of six assistant professors and 15 engineers and technical staff members. During this period, the unit also welcomed 10 postdoctoral researchers and 10 PhD students.

  — Hability to raise funds, to successfully apply for competitive funding, and to participate to the elaboration of call for projects and to the activity of competitiveness clusters

This aspect is one of the main strengths of GenHort though, depending on the context, all teams are not equally successful (see Section 2 above). However, thanks to the existence of strong links of GenHort with industrial partners and with the Végépolys competitiveness cluster and to the recognition of the scientific quality of the GenHort teams in their respective fields of research, GenHort did not face any major funding problem.

  — Participation to international or national scientific networks, existence of stable collaborations with foreign partners

GenHort teams are included in national and international networks, projects and consortia, some for many years now.

— Valorization of research results and establishment of socioeconomic or cultural partnership

GenHort has been very successful in creating new varieties for woody ornamentals (ten new varieties protected, six varieties released) and apple (six varieties protected by EC PVRs, two varieties released).

- Appreciation on the strategy, management and life of the research unit

— Relevance of the research unit organization, quality of the management and of the communication policy

GenHort management of both human and financial resources appears of high quality considering the diversity of origin of scientific and technical staff and of plant species studied, the necessary evolutions and focusing on new research topics in some groups, the integration into the IFR QUASAV, the collaborations with Végépolys and industrial partners and the preparation of the IRHS/RIHS Institute and SFR QUASAV.

— Relevance of the initiatives aiming at the scientific animation and at the emergence of cutting edge projects

The co-existence of three teams with three research objectives (axes), each with a responsible, can be confusing to understand if the groups really function as teams with focused objectives and corresponding budget.

— Contribution of the research unit staff members to teaching and to the structuration of the research at the local level

There is a large proportion of professors and assistant-professors compared to INRA scientists implying a heavy involvement in teaching.

- Appreciation on the project

— Existence, relevance and feasibility of a long term (5 years) scientific project

See paragraph 4 for the projects on the new teams issued from GenHort.

— Existence and relevance of a policy for the allocation of resources

It is assumed that the new teams issued from GenHort will conform to the general policy in use in the new IRHS/RIHS they will integrate in 2012.

— Originality and existence of cutting edge projects

See paragraph 4 for the projects on the new teams issued from GenHort.

Report (UMR A77 PaVé)

1d • Introduction

- Date and conduct of the visit

See paragraph 1a; report IRHS/RIHS.

- History and geographical location of the unit and brief description of its field of study and activities

The Laboratory "Pathologie Végétale/Plant Pathology" (PaVé; UMR A77) is a joint research unit that was created in 2000 between INRA, the University of Angers and the formerly "Institut National d'Horticulture" (INH, now Agrocampus Ouest). The research unit has been under the heading of Charles MANCEAU (INRA, director) and Philippe SIMONEAU (University of Angers, deputy director) for the past four years and consisted of four teams (see below). The scientific activities of the PaVé unit were centered on phytopathogenic bacteria (Teams 1 and 2) and fungi (Teams 3 and 4), addressing questions relevant to three of the four thematic fields of the INRA Plant Health Division: Functional genomics and interaction mechanisms, Epidemiology, and Disease management in agroecosystems.

The research unit is located at three sites separated by about 500 meters.

The unit is organized in four research teams:

1) Ecology, diversity and taxonomy of phytopathogenic bacteria (EDTaBP), addressing four main domains:

a) Taxonomy and phylogeny of *Xanthomonas and Pseudomonas groups*;

b) Molecular determinants of host specificity in *Xanthomonas*;

c) Molecular determinants of plant-to-seed transmission of bacteria;

d) Emergence and reemergence of bacterial diseases.

This research group manages the CFPB (French Collection of Phytopathogenic Bacteria), a certified biological resource aimed at preserving and distributing plant bacterial strains to researchers, teachers and industries.

2) Functional genomics of the *Erwinia amylovora* / apple tree interaction team (GEFIN), addressing two main domains:

a) Determinism of the interaction *E. amylovora* / fire blight;

b) Plant defense simulators able to protect apple against pests and diseases.

3) Evolutive ecology of fungal pathosystems (2EPF), addressing three main domains:

a) Durable resistance of apple to *Venturia inaequalis*;

b) Phylogeography and evolution of *V. inaequalis* populations;

c) Effect of host diversity on disease epidemiology and pathogen adaptation.

4) Necrotrophic fungal complexes team (CFN), addressing the determinism of interactions between necrotrophic pathogens (*Alternaria* spp.) and their host plants (Brassicaceae, carrot).

The four teams work on biological models (pathosystems) of economic significance, especially, but not exclusively, at the regional level: bacterial diseases of vegetable crops (Team 1), apple fire blight (Team 2) and scab (Team 3), and fungal diseases of vegetable crops (Team 4).

- Management team

Charles MANCEAU and Philippe SIMONEAU head the unit, and also Teams 1 and 4, respectively. Marie-Noëlle BRISSET and Bruno LE CAM head Teams 2 and 3, respectively. The CFPB bacterial collection (5,400 strains) is headed by Marion LE SAUX and curated by Perrine PORTIER (permanent position since end 2009).

- Staff members

	PAST	FUTURE
N1: Number of professors (see Form 2.1 of the unit's dossier)	10	Not relevant
N2: Number of EPST, (Public scientific and technological institution) or EPIC, (Public industrial and commercial institution) researchers (see Form 2.3 of the unit's dossier)	6	Not relevant
N3: Number of other professors and researchers (see Form 2.2 and 2.4 of the unit's dossier)	0	Not relevant
N4: Number of engineers, technicians and tenured administrative staff members (see Form 2.5 of the unit's dossier)	22	Not relevant
N5: Number of engineers, technicians and non-tenured administrative staff members (see Form 2.6 of the unit's dossier)	3	Not relevant
N6: Number of doctoral students (see Form 2.7 of the unit's project dossier)	8	Not relevant
N7: Number of persons accredited to supervise research	8	Not relevant

2d • Assessment of the unit

- Overall opinion

Globally, the research carried out at the unit can be qualified as very good. The unit is clearly visible in the regional and national landscapes and has successfully increased its visibility in the international research landscape. In parallel, the unit teams have addressed original, emerging themes, often new to them, and significantly increased their publication level, while keeping or even increasing transfer of knowledge and expertise to the regional plant industries. They also have been very successful in grant applications at regional, national (ANR) and professional levels. Therefore, their international success via European COST networks, bilateral projects and expertise has increased.

- Strengths and opportunities

The success of the unit mostly relies on the use of biological models of regional socio-economical interest, for which the team members have a long scientific and practical experience, to address scientific questions of general interest. The teams have a deep knowledge of the biological material, preserved in well-managed collections. They have increased their skills in the most modern techniques (for instance, genomics, population genetics, modeling). Through the joint research unit, the teams have access to well-trained students while contributing to the structuration of research and teaching at the regional (western France) level.

- Weaknesses and threats

The major threat deals with the geographical dispersion of the unit teams, and to a lesser extent, to the diversity of its research themes and biological models compared with the relatively low number of staff members and their heavy teaching load. The committee did note that this could be solved with the creation of the future IRHS/RIHS and some rearrangement of the teams in the new organization. Moreover, preserving a good balance between academic and applied research, and corporate and agency funding as well, might be a challenge for the future.

- Recommendations for the unit director

Not relevant.

- Production data

(cf. http://www.aeres-evaluation.fr/IMG/pdf/Criteres_Identification_Ensgts-Chercheurs.pdf)

A1: Number of produisants (professors and researchers whose names appear in a minimum number of "publications" over a 4- year period) as listed in N1 and N2 in the project column	14
A2: Number of produisants among the other staff listed in N3, N4 and N5 in the project column	2
A3: Proportion of produisants in the unit [A1/(N1+N2)]	0.875
A4: Number of theses for accreditation (HDR) to supervise research defended	3
A5: Number of PhD theses defended	10

3 d • Specific comments on the research unit

- Appreciation on the results

— Pertinence and originality of the research, quality and impact of the results

The research made in the unit has been published in the relevant top disciplinary (bacteriology, mycology) journals. Compared to the 2002-2006 period, the researchers have made an effort to publish in more general journals with higher IF (*PLoS One, Applied and Environmental Microbiology, Molecular Plant-Microbe Interactions*). More specifically, the teams address original questions such as bacterial disease transmission without infection, fungal phylogeography and seed infection. Some of these questions are not new but have remained unsolved until now, and are being revisited by the teams using relevant new concepts, techniques or skills. Most of the experimental results have been applied, or are expected to be transferred in a near future, to practical issues in plant breeding and management of plant pests and diseases.

— Number and quality of the publications, scientific communications, thesis and other productions

The laboratory produced three patents and 70 peer-reviewed publications since 2006. The unit members have presented communications in scientific and professional conferences, reaching a large and diversified audience. Eleven PhD theses have been defended, with a good level of publication first-authored by the PhD students. Since 2006, two more scientists have successfully defended their habilitation to conduct research (HDR), and a few more plan to do it in 2011.

— Quality and stability of partnerships

The laboratory has developed durable partnership with a wide range of industrial and academic partners, for instance via the management of the Cosave regional program and the contribution to the set up of the Végépolys cluster and the Valinov center of innovation.

- Appreciation on the impact, the attractiveness of the research unit and of the quality of its links with international, national and local partners

— Number and reputation of the awards obtained by staff members, including invitations to international conferences and symposia

The unit members totalize ten invitations to international conferences.

— Hability to recruit high level scientists, post-docs and students, particularly from abroad

The unit has recruited one invited professor, a visiting scientist and six post-docs. Two assistant professors (permanent positions) have also been recruited.

— Hability to raise funds, to successfully apply for competitive funding, and to participate to the elaboration of call for projects and to the activity of competitiveness clusters

There is a very good success of the team members to get grants from the Region. Efforts should be made to ensure that team members be more competitive in response to calls for national and international projects. They can be expected to take the leadership of some of these projects.

— Participation to international or national scientific networks, existence of stable collaborations with foreign partners

The unit members have coauthored 15 publications with foreign laboratories. This concerns mostly Team 1, which acts as one the world's leading teams working on the *Xanthomonas* group, and Team 3, which has developed international collaborations to study the phylogeography of apple scab at the world's scale.

— Valorization of research results and establishment of socioeconomic or cultural partnership

Three patents have been filed. The unit members are deeply involved in the regional network of plant industries through their partnerships with vegetable seed companies and apple growers.

- Appreciation on the strategy, management and life of the research unit

— Relevance of the research unit organization, quality of the management and of the communication policy

The unit has dedicated councils and common services, including a responsible for quality insurance. Publication records, especially in professional journals and technical conferences, highlight the efficacy of the communication policy.

— Relevance of the initiatives aiming at the scientific animation and at the emergence of cutting edge projects

The unit has been encouraged by the 2006 evaluation committee to increase its commitment to new programs, which has been done with success. The unit has been involved in the organization of several academic and professional conferences, which for sure helped to define emerging projects.

— Contribution of the research unit staff members to teaching and to the structuration of the research at the local level

The teachers of the unit devote a large part of their time to the joint structuration of teaching and research at the regional level (set up of the Quasav SFR,; Cosave program). The teachers and the scientists are involved in the management of the Venam doctoral school, and contribute to the BioVGPA master, created in 2008 by members of six universities from western France.

- Appreciation on the project

— Existence, relevance and feasibility of a long term (5 years) scientific project

See projects of new teams integrating the IRHS/RIHS Institute, paragraph 4.

— Existence and relevance of a policy for the allocation of resources

Teams joining the new IRHS/RIHS Institute will conform to the rules in use in this institute.

— Originality and existence of cutting edge projects

See projects of the teams joining the new IRHS/RIHS Institute, paragraph 4.

Report (UMR 1191 PMS)

1e • Introduction

- Date and conduct of the visit

See Paragraph 1a (Report IRHS/RIHS).

- History and geographical location of the unit and brief description of its field of study and activities

The Laboratory "Physiologie Moléculaire des Semences / Molecular Physiology of Seeds" (PMS; UMR1191) is a joint research unit that was created in 2000 between the University of Angers, INRA and the formerly "Institut National d'Horticulture" (now Agrocampus Ouest). The research unit has been under the heading of Olivier Leprince (director) and Anis Limami (deputy director) for the past four years and consisted of three teams (see below). The scientific activities of the PMS unit were centered on seeds, mainly from legume plants, both on model and crop plants, with particular attention to the identification of genes involved in physiological seed quality as well as to document their role and interactions in response to abiotic stress.

At the plant level, this research was focused on the characterization of the genetic and environmental aspects of the biological functions that determine germination and seedling emergence. At the cellular and molecular level, the UMR focus was on the characterization of the protective and regulatory mechanisms involved in abiotic stress tolerance (water, cold), survival in the dry state (desiccation tolerance, longevity), amino acid metabolism, respiration and mitochondrial function. This research was based on global expression profiling approaches as proteomics, transcriptomics, and also on several complementary approaches including molecular and quantitative genetics, biochemistry, together with physiology, ecophysiology and computer-assisted simulation. The majority of the work focused on legumes with *Medicago truncatula* and pea as main models. Work was also carried out on *Arabidopsis thaliana* to facilitate functional analysis or on economically relevant species for agronomic studies of emergence.

The research unit is located at two sites separated by about 500 meters.

The unit is organized in three research teams that address the following questions:

1) What are the protective and regulatory mechanisms involved in seed stress tolerance, in particular the survival in the dry state? (TAS)

2) What are the links between seed vigor, reserve mobilization and nitrogen metabolism during germination and seedling establishment? (MORE)

3) What are the respective contributions of environmental factors, seed characteristics and genotypes on germination and emergence results, and what is the genetic determinism of tolerance to the main environmental stresses during emergence? (EDGML).

Furthermore, the laboratory contains a small team dedicated to computational analyses and databases. This work is mainly carried out in collaboration with the Department of Informatics of the University of Angers.

- Management team

During the past years, Olivier LEPRINCE (director) and Anis LIMAMI (deputy director) headed the unit. Sylvie CASSIN was in charge of the administration duties and bioinformatics aspects (databases) were under the supervision of Emmanuel JASPARD.

- Staff members

	PAST	FUTURE
N1: Number of professors (see Form 2.1 of the unit's dossier)	12	Not relevant
N2: Number of EPST, (Public scientific and technological institution) or EPIC, (Public industrial and commercial institution) researchers (see Form 2.3 of the unit's dossier)	1	Not relevant
N3: Number of other professors and researchers (see Form 2.2 and 2.4 of the unit's dossier)	0	Not relevant
N4: Number of engineers, technicians and tenured administrative staff members (see Form 2.5 of the unit's dossier)	10	Not relevant
N5: Number of engineers, technicians and non-tenured administrative staff members (see Form 2.6 of the unit's dossier)	3	Not relevant
N6: Number of doctoral students (see Form 2.7 of the unit's project dossier)	6	Not relevant
N7: Number of persons accredited to supervise research	8	Not relevant

2e • Assessment of the unit

- Overall opinion

Globally, the research carried out at the unit can be qualified as good to excellent. The unit is clearly visible in the French and international research landscape. However, the committee noticed some heterogeneity in the performances of the various teams, such that the quality and originality of the research of some teams were clearly at high international standard, while others were somehow less competitive. This is also heterogeneity as to the level of funding that the various teams can attract into the unit. However on the whole, the unit groups have been quite successful in grant applications.

- Strengths and opportunities

This unit is an excellent example of the value of an association between INRA, University and Agrocampus Ouest by providing excellence in teaching, research and the training of PhD students. Laboratory members trained 11 Master-1, seven Master-2 students and nine PhD students during the last period and produced 47 publications in journals with good to high visibility. The different teams have been able to tie excellent collaborations, national and international, giving them access to cutting-edge technologies and/or knowledge. It is worth noting the joint team with SNES-GEVES, which is the national authority as regard to the commercialization of seedlots in France. Furthermore, the SNES-GEVES has a leading position within the international association ISTA, which edicts rules for evaluation of seed quality in commercial seedlots.

- Weaknesses and threats

The major threat deals with the geographical dispersion of the unit teams. This is reflected by the fact that only one paper involved cooperative work between the teams. The committee did note that this could be solved with the creation of the future IRHS/RIHS Institute to which will join the PMS unit. One general problem for this PMS unit results from the heavy teaching load of their members.

- Recommendations for the unit director

Not relevant.

- Production data

(cf. http://www.aeres-evaluation.fr/IMG/pdf/Criteres_Identification_Ensgts-Chercheurs.pdf)

A1: Number of produisants (professors and researchers whose names appear in a minimum number of "publications" over a 4- year period) as listed in N1 and N2 in the project column	12
A2: Number of produisants among the other staff listed in N3, N4 and N5 in the project column	2
A3: Proportion of produisants in the unit [A1/(N1+N2)]	0.92
A4: Number of theses for accreditation (HDR) to supervise research defended	2
A5: Number of PhD theses defended	9

3 e • Specific comments on the research unit

- Appreciation on the results

— Pertinence and originality of the research, quality and impact of the results

Very good publication records of the unit attest the relevance and the originality of the research conducted. Globally, the laboratory produced one patent and 47 peer-reviewed publications since 2006 mainly in Plant Sciences (56%), Agronomy (16%), Biochemistry and Molecular Biology (10%). Seventy-five percent of those publications appeared in journals that are considered excellent or exceptional according to the criteria referenced by INRA (*Science, Plant Cell, The Plant Journal, Plant Physiology, New Phytologist*), a number of them in journals with an IF >6.

— Number and quality of the publications, scientific communications, thesis and other productions

See above. Numerous oral and poster communications have been presented, mainly in international symposiums. Nine PhD theses have been defended and the results published in international peer-reviewed publications.

— Quality and stability of partnerships

To take an example, the partnership with SNES-GEVES is well exemplified by the creation of a joint team within the UMR PMS. This has enabled significant advances in both fundamental aspects and application development in the field of detailed and precise phenotyping of germination and seedling establishment. The implementation of this tool is accompanied by the creation of many links with public and private partners, both at national and European level.

- Appreciation on the impact, the attractiveness of the research unit and of the quality of its links with international, national and local partners

Unit members are well recognized at the national level, and in general at the international level.

— Number and reputation of the awards obtained by staff members, including invitations to international conferences and symposia

Team members totalize seven invitations to international conferences.

— Hability to recruit high level scientists, post-docs and students, particularly from abroad

Along the last years the laboratory has been successful to attract good scientists, as shown by the recruitment since 2006 of two assistant professors and five engineers and technical staff members. During this period, the units also welcomed three postdoctoral researchers and six PhD students.

— Hability to raise funds, to successfully apply for competitive funding, and to participate to the elaboration of call for projects and to the activity of competitiveness clusters

There is a good success of the team members to get grants from the Region. In early 2010 A Marie Curie fellowship "IDIOMSEED" has been awarded to a postdoc who is currently working in the laboratory (team CONCERTO). More recently, a KBBE projet "CONVIGOR" has been accepted and funded. It will start in 2011 (TEAM BGL) Efforts should be made to ensure that team members be more competitive in response to calls for national and international projects. There are also expected to coordinate some of such projects.

— Participation to international or national scientific networks, existence of stable collaborations with foreign partners

Good collaborations do exist as attested by several publications associating foreign laboratories.

— Valorization of research results and establishment of socioeconomic or cultural partnership

One patent has been granted worlwide. Furthermore the results are valorized owing to the strong cooperation with SNES-GEVES, hereby facilitating the transfer of knowledge from the public to the private sector.

- Appreciation on the strategy, management and life of the research unit

— Relevance of the research unit organization, quality of the management and of the communication policy

The unit organization is highly relevant considering publication records and number of young scientists trained. The quality of the management allowed increasing the competitiveness of the teams, hence contributing to a wide recognition of the unit in seed research and applications.

— Relevance of the initiatives aiming at the scientific animation and at the emergence of cutting edge projects

Several cutting edge projects are presently running as genome sequencing of a recalcitrant plant species, discovery of seed biomarkers useful to characterize seed vigor and longevity and development of novel tools as high throughput phenotyping of seed features.

— Contribution of the research unit staff members to teaching and to the structuration of the research at the local level

The professors and associate professors from the University of Angers and Agrocampus Ouest together with several technicians dedicate 50% of their time to education and training. Therefore, the laboratory is actively involved in organizing and administrating BSc and Msc curriculum dealing with plant and seed production at the University of Angers and Agrocampus Ouest. Staff members including INRA researchers dispense all together more than 2,300 h teaching per year in various disciplines ranging from plant sciences to cellular biology, biochemistry and agronomy both in initial and permanent education, and trained 18 undergraduate students into research during their internship. Sixty-four percent of the researchers have their habilitation to supervise PhD students (HDR). Nine PhD students defended their thesis over the 2006-2010 period.

- Appreciation on the project

— Existence, relevance and feasibility of a long term (5 years) scientific project

See projects presented by the new teams participating to the creation of the IRHS/RIHS.

— Existence and relevance of a policy for the allocation of resources

The unit teams will conform to the policy in use in the new IRH/RIHS they will join in 2012.

— Originality and existence of cutting edge projects

See projects presented by the new teams participating to the creation of the IRHS/RIHS.

4 • Appreciation team-by-team and/or project-by-project

Team 1: Integrative biology of architecture within its environment / *Biologie intégrative de l'architecture et environnement* (Arch-E)

Project leader: M. Soulaiman SAKR

Assistant PIs: M. Alain VIAN & M. Vincent GUERIN

- Staff members

	PAST	FUTURE
N1: Number of professors (see Form 2.1 of the unit's dossier)	Not relevant	9
N2: Number of EPST, (Public scientific and technological institution) or EPIC, (Public industrial and commercial institution) researchers (see Form 2.3 of the unit's dossier)	Not relevant	2
N3: Number of other professors and researchers (see Form 2.2 and 2.4 of the unit's dossier)	Not relevant	0
N4: Number of engineers, technicians and tenured administrative staff members (see Form 2.5 of the unit's dossier)	Not relevant	12.5
N5: Number of engineers, technicians and non-tenured administrative staff members (see Form 2.6 of the unit's dossier)	Not relevant	0
N6: Number of doctoral students (see Form 2.7 of the unit's project dossier)	Not relevant	3
N7: Number of persons accredited to supervise research	Not relevant	4

- Appreciation on the results

See the report of SAGAH unit (paragraphs 1b-3b).

- Appreciation on the impact, the attractiveness of the research unit and of the quality of its links with international, national and local partners

See the report of SAGAH unit (paragraphs 1b-3b).

- Appreciation on the project

  — Existence, relevance and feasibility of a long term (5 years) scientific project

The team proposes a well-focused project and the expected data are promising. However, some aspects seem to be redundant with those proposed by the GDO (Genetic determinism and diversity in ornamentals) team (Team 2). For example, both groups are interested by the activity of the meristems leading to the development of vegetative buds (that affect branching) or floral buds (that also affects branching). A clear scientific collaborative strategy should help addressing this issue.

There are several difficulties associated with the rose as a model species, which can hamper molecular and genetic studies. The interaction with GenHort and with other national and international groups working on the rose will help circumventing some of these difficulties. The group has a unique opportunity to address the role of light on bud burst and branching while this question can hardly be addressed in other model species such as *Arabidopsis.*

— Existence and relevance of a policy for the allocation of resource

The team will conform to the policy of the IRHS/RIHS Institute.

— Originality and existence of cutting edge projects

The project is interesting concerning its input in modeling as to the general development of the Virtual Plant.

- Conclusion

— Overall appreciation

Between 2006 and 2010, the team had a good publication track record although publications on the rose were in the minority. Yet, the team has greatly progressed in developing novel projects. Results are promising, especially for the role of sugar, light and hormones in bud burst and its impact on branching and plant architecture.

— Strengths and opportunities

The team proposes a project on rose that is well focused, and that should benefit from the merger with GenHort in a same unit. The presence of the GDO team working on genetic aspects of rose flowering is an asset that would need to be strengthened.

Scientists belonging to Team 1 have complementary expertise spanning the panel of approaches being developed from visual architecture measurement, physiological and molecular expertise to virtual plant modeling.

— Weaknesses and threats

There is no clear indication whether work on other species than rose will continue. Moreover, there is no clear picture on which scientists will carry which project?

The interaction with GenHort (GDO Team) will be instrumental to achieve the proposed project and will open new avenues.

External fund raising is very modest.

The number of PhD and post docs is very low taking into account the number of permanent scientists (13).

The number of scientists accredited to supervise PhDs (HDR) is rather low.

The role of each of the coordinators is unclear (directors & scientific animation director?).

— Recommendations

The committee considers that Team 1 deserves support and advises this team to:

- mobilize its main forces at working on the rose model;

- state more clearly its collaborative strategy with Team 2 GDO, with other teams of IRHS/RIHS as well as with national and international collaborators;

- increase the number and impact of the publications;

- work on identifying financial funding to support the project (ANR, EU etc.);

- increase the number of scientists accredited to supervise PhDs and to be more efficient to attract good and motivated PhD students;

- participate more actively to the national and international Rose consortia.

Team 2: Genetic determinism and diversity in ornamentals / *Déterminisme génétique et diversité des plantes ornementales* (GDO)

Project leader: M. Fabrice FOUCHER

Assistant PI: Mrs Agnès GRAPIN

- Staff members

	PAST	FUTURE
N1: Number of professors (see Form 2.1 of the unit's dossier)	Not relevant	2
N2: Number of EPST, (Public scientific and technological institution) or EPIC, (Public industrial and commercial institution) researchers (see Form 2.3 of the unit's dossier)	Not relevant	1
N3: Number of other professors and researchers (see Form 2.2 and 2.4 of the unit's dossier)	Not relevant	2
N4: Number of engineers, technicians and tenured administrative staff members (see Form 2.5 of the unit's dossier)	Not relevant	9.5
N5: Number of engineers, technicians and non-tenured administrative staff members (see Form 2.6 of the unit's dossier)	Not relevant	2
N6: Number of doctoral students (see Form 2.7 of the unit's project dossier)	Not relevant	2
N7: Number of persons accredited to supervise research	Not relevant	2

- Appreciation on the results

The Team "Woody ornamentals" generated studies on characterization, creation and strategies for the development of variability within groups of ornamental shrub species. Since 2003, fundamental research has been carried out on the garden rose as model to understand the key processes in the elaboration of the quality of an ornamental plant: architecture and flowering. In parallel, research and breeding on other woody ornamental plants were conducted to preserve and manage genetic diversity and also to breed new varieties.

The team main stakes are to produce know-how, expertise and plant material to feed partnerships with companies and actors involved in the preservation of genetic diversity on the one hand, and to produce academic knowledge based on scientific partnerships on the other.

Between 2006 and 2010, the main objectives of the team were (1) to understand the genetic and molecular processes in the elaboration of the quality in ornamentals plants: architecture and flowering (rose); (2) to preserve and analyze the genetic diversity (Pelargonium, Hydrangea, rose) and (3) to develop methods to exploit and create variability (Hydrangea, Genisteae).

During the last four years, the Team "Woody Ornamental" has developed novel genetic and genomic resources for the study of flowering in rose: microsatellite markers and an integrated consensus map of rose (collaboration with University of Hannover, Texas A & M University, Plant Research International, Wageningen). They participated to the production of a rose Affymetrix chip (collaboration with ENS-Lyon), bioinformatics tools for detecting polymorphism (SNP Polymorfind), protocol for gene transfer and functional validation in strawberry as heterologous system. These tools will be useful to carry out the project presented by Team 2 GDO of the novel IRHS/RIHS Institute (see below).

The results presented by this UMR GenHort's team were mainly on genetic diversity of a set of woody plants and on molecular and genetic determinism of rose architecture:

- Identification of QTLs involved in several pathways controlling floral development and shape, fragrance, mildew and black spot resistance;

- Involvement of a *TFL1-like* gene, a floral repressor, as a key gene involved in the control of rose flowering (recurrent blooming rose vs. non continuous flowering phenotype);

- Highlighting the role of gibberellins in the control of flowering in roses.

- Appreciation on the impact, the attractiveness of the team and of the quality of its links with international, national and local partners

Team members have established strong national (INRA Bordeaux, CNRS-Poitiers, ENS-Lyon) and international (Germany, NL, Japan and USA) collaborations.

Angers is recognized as the main center of research and teaching in genetics of ornamental plants in France.

— Number and quality of the publications, scientific communications, thesis and other productions

Between 2006 and 2010, the team performed well with regard to publication track record, with 16 peer-review publications in good to excellent journals (*Journal of Biogeography (IF 4.08), Theoretical and Applied Genetics (IF 3.39), Tree Genetics & Genomes* (IF 2.02)). The focus of most of these publications was on the team main projects. It worth noting that the number and the quality of the publications on rose have been substantially improved since 2008, a progression that promises to increase further in coming years.

Four students have successfully defended their PhD thesis and published their results in peer-review journals. Three post-doctoral fellows have worked on rose architecture and genetic transformation.

Members of the group have participated in many national and international conferences where they presented their results.

In addition, 10 new plant varieties protected by COV "Certificat d'obtention variétal / Plant breeders' rights) were bred (Clematis, Hydrangea, Honeysuckle, Weigela… but no rose variety).

- Appreciation on the impact, the attractiveness of the research unit and of the quality of its links with international, national and local partners

— Number and reputation of the awards obtained by staff members, including invitations to international conferences and symposia

One invitation in an international symposium is recorded.

— Hability to recruit high level scientists, post-docs and students, particularly from abroad

Only two researchers are empowered to supervise research, but not the team leader. Two researchers planned to defend an HDR in the following years.

— Hability to raise funds, to successfully apply for competitive funding, and to participate to the elaboration of call for projects and to the activity of competitiveness clusters

Most of the funds raised by Team 2 were local or INRA. External fund (ANR, EU) raised were very modest.

The group has an internationally recognized expertise in cryopreservation and participated in the management of the COST 871 CryoPlaNet.

— Participation to international or national scientific networks, existence of stable collaborations with foreign partners

Team members are very active on development of rose genomics.

To this end they participate to:

- the international Rose genomic steering committee;

- the organization of the 1st international Rose genomic meeting;

the management of the database for the network of genetic resources of rose coordinated by the French Rose Federation.

— Valorization of research results and establishment of socioeconomic or cultural partnership

Since the beginning of the 1970s, members of the joint research unit GenHort have developed plant-breeding programs on ornamentals in partnership mainly with producers of woody plants. A method developed for Genisteae to improve management of genetic variability will be extended to a large number of decorative species within the framework of the project "Brio" coordinated by VALINOV (the valorization structure of the Végépolys competitiveness cluster) involving six professional partners and eight groups of ornamental species.

- Appreciation on the strategy, management and life of the research team

See above “Participation to international or national scientific networks”.

Four professors and assistant professors belong to this team.

- Appreciation on the project

— Existence, relevance and feasibility of a long term (5 years) scientific project

The project presented by the Team 2 “Genetic determinism and diversity in ornamentals” (GDO) is a continuation of the themes developed on ornamentals. It is an ambitious project with four major and complementary questions that deserves support.

Members of the Team 2 are sufficient in number and have the expertise to carry out the project. However, financial support seems to be still insufficient to reach the goals.

— Existence and relevance of a policy for the allocation of resource

The team will conform to the policy of the IHRS/RIHS.

— Originality and existence of cutting edge projects

The main challenge will be identify the molecular and physiological bases of recurrent blooming in rose and its putative regulation by gibberellins.

- Conclusion

— Overall appreciation

In the period 2006-2010, the team had a good publication track record. Compared to previous evaluation in 2006, they have greatly progressed in developing novel projects and the expected data are promising. They have added to the utility to make of the rose an ideal model for woody ornamental plants.

— Strengths and opportunities

This team has build strong collaborations at the national (INRA Bordeaux, Poitiers, Lyon) and international (Germany, NL, Japan and USA) levels. It has a set of genomic resources to work on rose and the prospect of the rose genome sequence.

— Weaknesses and threats

The main focus of this team is architecture and flowering/re-blooming. However, these subjects are not conducive to the establishment of partnership with rose breeders who are mainly interested in resistance to mildew and black spots.

The strategy to transfer the gained knowledge on the rose to other woody ornamentals is unclear.

There is no clear strategy on how each group member (especially permanent scientists) will be implicated in the proposed projects.

There is no clear collaboration with Team 1, though both teams are working on the same models.

— Recommendations

The committee considers that this team deserves support and advises this team to:

- identify and prioritize more accurately its research interests on rose, in particular to evaluate the pertinence to develop research on relationships between rose and its pathogens (mainly mildew). The group is producing excellent work on rose recurrent flowering but should rethink its strategy to increase its focus and to enhance the benefits resulting from the obtained data (parallel work in rose and strawberry). This effort will benefit from refocusing within the group but will also require strong support from external sources that can provide complementary skills;

- enhance coordination between projects and group members;

- work at identifying financial support to reach its goals;

- state more clearly its collaborative strategy with Team 1 (Arch-E), as well as with other teams of IRHS/RIHS Institute and with national and international teams in this research field;

- identify academic research questions on other ornamentals; in particular it would be worth knowing how other ornamentals could benefit from knowledge gained on the rose system.

Also, the committee encourages the team leader to rapidly defend an HDR to be empowered with supervising PhD students.

Team 3: Fruit quality / *Qualité des fruits* (FruitQual)

Project leader: M. François LAURENS

- Staff members

	PAST	FUTURE
N1: Number of professors (see Form 2.1 of the unit's dossier)	Not relevant	3
N2: Number of EPST, (Public scientific and technological institution) or EPIC, (Public industrial and commercial institution) researchers (see Form 2.3 of the unit's dossier)	Not relevant	1
N3: Number of other professors and researchers (see Form 2.2 and 2.4 of the unit's dossier)	Not relevant	0
N4: Number of engineers, technicians and tenured administrative staff members (see Form 2.5 of the unit's dossier)	Not relevant	3.5
N5: Number of engineers, technicians and non-tenured administrative staff members (see Form 2.6 of the unit's dossier)	Not relevant	0
N6: Number of doctoral students (see Form 2.7 of the unit's project dossier)	Not relevant	2.5
N7: Number of persons accredited to supervise research and similar	Not relevant	1

- Appreciation on the results

  — Appreciation on the impact, the attractiveness of the team and of the quality of its links with international, national and local partners

The "FruitQuality" team is a newly created team resulting from the split of the former PipFruit team in two teams focused on either fruit quality (Team 3) or resistance to disease and pests (Team 4). The PipFruit team was really successful in establishing strong links at national and European levels and beyond. This resulted in its participation to several European networks and programs such as the HiDRAS and ISAFRUIT EU-projects dealing with fruit quality. The latter was co-coordinated by a GenHort researcher. The quality of the research done and the strong links with both scientific partners and industrial end-users is further attested by the participation and coordination by the team of the EU KBBE projects FruitBreedomics beginning in 2011.

The main research topic (i.e. fruit texture) is clearly well focused and relevant to research on apple fruit quality. It beneficiates from close collaborations with a group from INRA Nantes specialized in cell wall analysis (the two teams are associated within the SFR QUASAV) and from the association, within the team, between geneticists and ecophysiologists aiming at modeling and predicting changes in apple fruit texture according to environmental conditions. The recent arrival in Team 3 of a scientist with strong expertise in transcriptome data management and analysis is timely with the recent sequencing of apple genome. It will further increase the range of expertise of the team and give access to new target genes and networks controlling variations in fruit texture.

Now that apple genome has been sequenced and that research efforts on fruit enter the post-genomics era, the team has other strong assets that will make it more attractive at international levels and even central in apple research: (i) large genetic resources that are being characterized at genetic and phenotypic levels, (ii) access to large (surface, manpower) experimental units, (iii) strong relationships with industrial partners (nurserymen, Végépolys).

The head of Team 3 will also work ½ time in Team 4, thus ensuring that coordination between the two research projects on apple will continue and that results from both Team 3 and Team 4 will be integrated to breed new apple varieties with improved disease resistance and apple fruit quality.

— Number and quality of the publications, scientific communications, thesis and other productions

Former members from the PipFruit team had a medium to low publication record (6 over 4 years for one professor, three assistant professors and one INRA research engineer) in specialized journals of medium ranking, but high productivity for breeding activity in PipFruit team (six varieties protected by PVRS, two varieties released). The INRA scientist joining the group has an excellent publication record from his former activity on plant transcriptomics. One PhD thesis was defended while three are underway in the Team 3. The number and quality (broader impact) of the publications should increase in the near future, by integrating all the approaches developed in the project, from genetics and ecophysiology to the functional validation of candidate genes. This should be done especially since PhD students are involved in the project.

— Quality and stability of partnerships

As stated above, the partnerships in this newly created research team are adequate both at regional (Team 4 ResPom from GENHORT, team from BIA Nantes on fruit texture, Végépolys competitiveness cluster etc…), national (links with other teams from the INRA Plant Genetic department, with an ecophysiology team from INRA Avignon modeling fruit growth and quality) and international (European networks and projects).

- Appreciation on the impact, the attractiveness of the research unit and of the quality of its links with international, national and local partners

— Number and reputation of the awards obtained by staff members, including invitations to international conferences and symposia

No invitations, as invited speakers, of team members in international conferences, as from the provided report.

— Hability to recruit high level scientists, post-docs and students, particularly from abroad

The recruitment of the proposed Institute's Director will give a novel impetus, in particular making use of available genomic sequences.

— Hability to raise funds, to successfully apply for competitive funding, and to participate to the elaboration of call for projects and to the activity of competitiveness clusters

Excellent. Funding does already exist for the three axes: EU-Fruit Breedomics (2011-2015), INRA GAP Division (ARYANE, 2009-2011), regional projects (strategic support, AI-Fruit, 210-2014).

— Participation to international or national scientific networks, existence of stable collaborations with foreign partners

Excellent. The group is a world leader in fruit genetics, breeding and genomics. They participate to a number of solid well-granted projects, at the European, national and regional levels.

— Valorization of research results and establishment of socioeconomic or cultural partnership

Excellent, see above.

- Appreciation on the strategy, management and life of the research team

— Relevance of the research team organization, quality of the management and of the communication policy

Excellent.

— Relevance of the initiatives aiming at the scientific animation and at the emergence of cutting edge projects

Excellent.

— Contribution of the research team staff members to teaching and to the structuration of the research at the local level

Out of six scientists, four members of the team are teachers from Agrocampus Ouest, indicating strong implication of the team in teaching activity. This team is highly active in the functioning of the SFR QUASAV, a federative structure, which gathers all laboratories involved in plant science at the regional level.

- Appreciation on the project

— Existence, relevance and feasibility of a long term (5 years) scientific project

Excellent. The project will clearly benefit from the arrival of two new senior scientists, which allows more ambitious objectives than in the previous period.

Fruit texture is clearly one of central question when dealing with apple fruit quality.

The project is timely because:

- the apple genome has very recently been sequenced and is publicly available. As a consequence, whole genome gene annotations will be available for DNA chips/RNA seq analysis aimed at identifying candidate genes and networks related to apple fruit texture;

- large genetic resources on apple and associated facilities do exist at Angers. Phenotyping technologies focused on fruit texture have been developed in collaboration, QTL mapping have been done on several progenies and candidate genes have been identified. To use these resources, the team expertise in apple genetics will be further supported by the new tools arising from the apple sequencing projects such as the 9K SNP chip (soon 30 – 40 K);

- collaboration with expert groups working either on fruit texture (INRA BIA Nantes) and on fruit quality modeling (INRA PSH Avignon) have already been established in France. Further collaborations have been established in Europe (EU projects) and beyond (NZ, US …);

- multi-year programs providing funding for the Team 3 projects are already secured (EU, INRA, private companies).

— Existence and relevance of a policy for the allocation of resource

The team will conform to the general policy of the future IRHS.

— Originality and existence of cutting edge projects

Not relevant at this stage of the team project.

- Conclusion

— Overall appreciation

Excellent realizations, excellent team, excellent project. Team 3 has an excellent potential for becoming a reference team on apple fruit texture.

— Strengths and opportunities

Strengths are clearly (i) a well focused scientific objective on apple fruit texture, (ii) the existing expertise within the group that encompasses several fields of research from genetics to ecophysiology and functional analysis, (iii) the genetic resources available in Angers on apple, (iv) the already existing network of collaboration at regional, national and international levels, (v) the funding sources available.

The main opportunity is clearly the sequencing of the apple genome, which ends up a period focused on the development of genetic/genomic tools to re-focus on biological questions using the two strengths of the Angers teams: the genetic resources and (to be further developed in the team) the functional analysis and validation of genes affecting apple fruit texture.

— Weaknesses and threats

The team has a small size and comprises researchers-cum-teachers with heavy duty of teaching, a team leader working ½ time in Team 3 and ½ time in Team 4, and a newly arrived scientist who should work ½ time in Team 3 but who will have in charge the newly formed very large unit IRHS. Depending on the technical support available, PhDs and post-doc, these forces might be insufficient to carry out the project as requested.

Another weakness is the current lack of high throughput tools for *in planta* functional analysis and validation of candidate genes in apple.

— Recommendations

The project is well-thought and already included in several funded projects for the coming years. The integration of genetic and ecophysiology approaches are very interesting and should be thought over in more detail. To prepare for the near-future, Team 3 should also consider (i) developing new tools and approaches for the functional analysis of target genes such as VIGS on apple fruit, generation of apple TILLING population and or use of rapid cycling mutant or transgenics, (ii) use new high throughput genotyping tools (SNP arrays) to map/identify genes controlling apple fruit texture.

The team deserves strong support.

Team 4: Apple and pear resistance to diseases and pests / *Résistance du pommier-poirier aux pathogènes* (ResPom)

Project leader: M. Charles-Eric DUREL

Assistant PI: Mrs Marie-Noëlle BRISSET

- Staff member

Proposed Team 4 merges the PaVé GEFIN Team and a part of the previous GenHort Pip fruit Team.

	PAST	FUTURE
N1: Number of professors (see Form 2.1 of the unit's dossier)	Not relevant	3
N2: Number of EPST, (Public scientific and technological institution) or EPIC, (Public industrial and commercial institution) researchers (see Form 2.3 of the unit's dossier)	Not relevant	3
N3: Number of other professors and researchers (see Form 2.2 and 2.4 of the unit's dossier)	Not relevant	0
N4: Number of engineers, technicians and tenured administrative staff members (see Form 2.5 of the unit's dossier)	Not relevant	14
N5: Number of engineers, technicians and non-tenured administrative staff members (see Form 2.6 of the unit's dossier)	Not relevant	1
N6: Number of doctoral students (see Form 2.7 of the unit's project dossier)	Not relevant	1
N7: Number of persons accredited to supervise research	Not relevant	3

- Appreciation on the results

The teams were interested in the apple and pear resistance to diseases and pests (scab, fire blight, aphids and psylla) and worked in close collaboration. Scientific approaches were integrative, particularly for (i) the scab resistance durability in which the characterization and recombination of resistance factors were coupled with pathogenicity and population genetics studies on the fungus, and (ii) the interaction between *Erwinia amylovora* and its hosts plants.

— Number and quality of the publications, scientific communications, thesis and other productions

Number and quality were good: the two teams produced a total of 23 scientific publications related to disease resistance (*Nature Genetics* (IF 34.28), *Bioinformatics* (IF 4.93), *Plant Pathology* (IF 2.37), *Tree Genetics & Genomes* (IF 2.02), *Theoretical Ecology* (IF 1.4)), two book chapters and six new apple varieties (four dessert apple cultivars and two ciders cultivars). A patent concerning low-density array for apple defense stimulator study has been submitted.

Three theses were defended and resulted in 1, 2 and 3 publications.

One team scientific member was "*non produisant*" but corresponded to only 0.1 FTE.

— Quality and stability of partnerships

Partnerships with complementary partners are adequate both at regional (Team 5 Ecofun, Végépolys), national (AgroParisTech) and international (ETH Zürich, FEM-IASMA Italy, PRI-Wageningen).

- Appreciation on the impact, the attractiveness of the research unit and of the quality of its links with international, national and local partners

  — Number and reputation of the awards obtained by staff members, including invitations to international conferences and symposia

Two invitations to international conferences.

  — Hability to recruit high level scientists, post-docs and students, particularly from abroad

Three postdocs (unspecified countries) and five PhD students.

  — Hability to raise funds, to successfully apply for competitive funding, and to participate to the elaboration of call for projects and to the activity of competitiveness clusters

The ability to obtain external funding has been good: several private fundings, two FUI projects (collaborative projects based on public-private partnership and involving the participation of competitiveness clusters), and one national ANR project. Some funding has already been obtained for the next years.

  — Participation to international or national scientific networks, existence of stable collaborations with foreign partners

The leadership in apple/pear disease resistance has been recognized at the national and international level and has brought new collaborations with teams in Switzerland and Italy in resistance gene cloning projects. The team is also a partner of the European network ENDURE and national projects.

  — Valorization of research results and establishment of socioeconomic or cultural partnership

The results of current research may provide new strategies in breeding programs, especially concerning resistance durability. The apple Ariane, resistant to scab, developed from 2002, represents now 1% of the French apple orchard.

- Appreciation on the strategy, management and life of the research team

Excellent.

- Appreciation on the project

  — Existence, relevance and feasibility of a long term (5 years) scientific project

The team continues the main topics conducted previously that are genetic and molecular determinants of apple and pear resistance to main pathogens and pests. They include integrated defense responses, from perception to induced defenses, constitutive defenses, durability of resistance factors alone or in combination and the use of defense stimulators. This is an ambitious program whose team seems to have the means (tools and workforce) to manage the various aspects. The team also includes the GenHort fruit varieties breeding platform. Some funding has already been obtained for the next years.

— Existence and relevance of a policy for the allocation of resource

The team will conform to the policy of the novel IRHS/RIHS Institute.

— Originality and existence of cutting edge projects

Excellent.

- Conclusion

— Overall appreciation

The new organization within the ResPom team gives a more cohesive working on apple and pear resistance to pests. The team has great potential. It showed a very good scientific production and its ability to fund its research.

The interest of the project is that it combines different strategies to improve the resistance. Applied goals will be also developed in the fruit breeding platform included in the team.

— Strengths and opportunities

Close collaboration with Team 5 (ECOFUN) for the pathogen side.

Diversity of approaches and appropriate tools.

— Weaknesses and threats

There is one lack in appropriate tools: high throughput tools for *in planta* functional analyses and validation of candidate genes in apple.

— Recommendations

The interest of the project is that it combines different strategies, but according to the results obtained, it may be appropriate to redeploy resources on certain aspects over others.

The team deserves unreserved support.

Team 5: Evolutionary ecology in fungi / *Ecologie évolutive chez les champignons* (ECOFUN)

Project leader: M. Bruno LE CAM

- Staff members

	PAST	FUTURE
N1: Number of professors (see Form 2.1 of the unit's dossier)	Not relevant	1
N2: Number of EPST, (Public scientific and technological institution) or EPIC, (Public industrial and commercial institution) researchers (see Form 2.3 of the unit's dossier)	Not relevant	3
N3: Number of other professors and researchers (see Form 2.2 and 2.4 of the unit's dossier)	Not relevant	0
N4: Number of engineers, technicians and tenured administrative staff members (see Form 2.5 of the unit's dossier)	Not relevant	3
N5: Number of engineers, technicians and non-tenured administrative staff members (see Form 2.6 of the unit's dossier)	Not relevant	0
N6: Number of doctoral students (see Form 2.7 of the unit's project dossier)	Not relevant	2
N7: Number of persons accredited to supervise research	Not relevant	2

- Appreciation on the results

— Appreciation on the impact, the attractiveness of the team and of the quality of its links with international, national and local partners

This team focuses its research activity on pathogen adaptive dynamics in response to the genetic and spatial diversification of their host.

This is a multidisciplinary team, working on the apple scab pathosystem at different levels: genomic to epidemiological, with theoretical and experimental approaches. The team has obtained very interesting results, well published in the last years, and has very good links in the apple scab community and the apple-growing industry. This team is attractive since one associate professor, four PhD students and two post-docs have joined it.

The main results obtained since 2007, concerned the genetic evolution of the fungus, *Venturia inaequalis*, in relation with the domestication of its host. The results obtained on the origin and colonization history of new virulent strains at the genetic and epidemiological levels are very relevant and original.

The modeling approach concerns the building of a spatialized population genetics model that relates the evolution of the pathogen population to the genetic structure and spatial arrangement of the host population. Results showed that patchy distributions of monogenic resistances diversify pathogen population and reduce the efficacy of resistance genes. This model was extended to the case of partial resistance, variety mixtures carrying combination of resistance genes and QTLs. This part of research is done in collaboration with the ResPom team.

— Number and quality of the publications, scientific communications, thesis and other productions

Between 2007 and 2010, the team performed well with regard to publication track record, with 17 publications in good journals. The focus of most of these publications was on the Team main projects. Four students have successfully defended their PhD thesis and published their results. Members of the group have participated in many national and international conferences where they presented their results.

- Appreciation on the impact, the attractiveness of the research unit and of the quality of its links with international, national and local partners

  — Number and reputation of the awards obtained by staff members, including invitations to international conferences and symposia

Two invitations in international symposiums are recorded.

  — Hability to recruit high level scientists, post-docs and students, particularly from abroad

Two post-doctoral fellows have worked on the team projects. Actually, three PhD students are working in the team.

  — Hability to raise funds, to successfully apply for competitive funding, and to participate to the elaboration of call for projects and to the activity of competitiveness clusters

The ability to obtain external funding has been very good: three ANR projects, three regional projects, three INRA projects.

  — Participation to international or national scientific networks, existence of stable collaborations with foreign partners

The team is involved in three international scientific projects and has many collaborations with international teams resulting in co-authored publications.

  — Valorization of research results and establishment of socioeconomic or cultural partnership

The team developed and protected a software aimed at the design of suitable strategies of geographical deployment of resistant cultivars.

- Appreciation on the project

  — Existence, relevance and feasibility of a long term (5 years) scientific project

The team project focuses on two main objectives:

- Identification and evolutionary dynamics of genes or genomic regions involved in V. inaequalis adaptation to hosts.

The available sequence genome of V. inaequalis and the EST produced are important genomic tools to start the detection of genomic regions under host selection pressure that could be important in pathogen adaptation.

- Modeling spatial-temporal dynamics of emergence and invasion.

The objective is to build demo-genetic models taking into account the emergence of virulent mutants, pathogen dispersal and the spatial distribution of resistance factors.

These projects are well defined in collaboration with national teams working on fungal effectors and with two teams of the TGU IRHS FungiSem (the functional part of the project) and FruitQual teams.

— Existence and relevance of a policy for the allocation of resource

The team will conform to the policy of the IRHS/RIHS Institute.

- Conclusion

— Overall appreciation

Multidisciplinary team, working on the apple scab pathosystem at different levels: genomic to epidemiological, with theoretical and experimental approaches.

This young team has increased its publication rate; the head of the team has defended his HDR in 2010 and a young associate professor arrived in the team in 2008.

— Strengths and opportunities

The results obtained by the team on the evolution of the apple scab system and on modeling spatial deployment of gene-for-gene resistance are relevant and innovative. The team has good collaborations with national and international teams working on pathogen fungi and with national apple growers.

— Weaknesses and threats

The team has very interesting results and has a good visibility in the apple scab community; they do not rate enough their work at an international level in the Evolutionary Biology community.

The relatively small size of the team may threaten the balance between academic and applied activities, which are both necessary for the progress of the research questions addressed by the team.

— Recommendations

The team is encouraged to be more offensive to reach an international leadership. The team is encouraged to maintain its level of collaborations and its involvement in both academic and transfer activities.

The team deserves unreserved support.

Team 6: Carrot quality and resistance to bio-aggressors / *Qualité et résistance aux bioagresseurs chez la carotte* (CARROT)

Project leader: Mrs Mathilde BRIARD

Assistant PI: M. Emmanuel GEOFFRIAU

- Staff members

	PAST	FUTURE
N1: Number of professors (see Form 2.1 of the unit's dossier)	Not relevant	6
N2: Number of EPST, (Public scientific and technological institution) or EPIC, (Public industrial and commercial institution) researchers (see Form 2.3 of the unit's dossier)	Not relevant	0
N3: Number of other professors and researchers (see Form 2.2 and 2.4 of the unit's dossier)	Not relevant	0
N4: Number of engineers, technicians and tenured administrative staff members (see Form 2.5 of the unit's dossier)	Not relevant	5
N5: Number of engineers, technicians and non-tenured administrative staff members (see Form 2.6 of the unit's dossier)	Not relevant	0
N6: Number of doctoral students (see Form 2.7 of the unit's project dossier)	Not relevant	2.5
N7: Number of persons accredited to supervise research	Not relevant	2

- Appreciation on the results

The team coordinates the network of genetic resources "carrot and the other daucus" and manages the national collection. The team managed two different topics: the genetic and molecular determinism of disease resistance to *Alternaria dauci*, and the management and characterization of genetic resources. This last point focused on intra and inter-population diversity in carotenoid nature and content. This constitutes a carrot quality trait of high relevance to the breeders and industrial partners since carrots can be more or less appealing to the consumers depending on their color conferred by the carotenoids. Considering the minor species status of carrot, the results of the study done have been valorized in journals with impact factors in the range of good GenHort publications, which somehow contrasts with the large interest in plant carotenoids, as judged from the present literature and strong international competition. Characterization of the resistance to *Alternaria* is relevant given the impact of the disease (uneffective fungicides, varieties with unsufficient partial resistance, poorly understood mechanisms of resistance). The team confirmed the polygenic nature of the resistance and hypothesized that different resistance mechanisms exist among tolerant cultivars.

— Number and quality of the publications, scientific communications, thesis and other productions

The team produced 13 publications, among which nine are directly linked to the two main topics. According to the criteria referenced by INRA, they can be classified as exceptional (3), excellent (4) and correct (3). All the team scientific members are "*produisants*". Two PhD theses were defended and resulted in two and three publications, respectively.

— Quality and stability of partnerships

The carrot team benefits from a strong support from industrial partners, from breeders to root processors, as testified by the high number of research projects involving these partners.

- Appreciation on the impact, the attractiveness of the research unit and of the quality of its links with international, national and local partners

— Number and reputation of the awards obtained by staff members, including invitations to international conferences and symposia

The team can only be credited of a single invitation to an international conference.

— Hability to recruit high level scientists, post-docs and students, particularly from abroad

Two postdocs (unspecified countries) and three PhD students have been recruited over the considered 2006-2010 period.

— Hability to raise funds, to successfully apply for competitive funding, and to participate to the elaboration of call for projects and to the activity of competitiveness clusters

The ability to obtain external funding has been rather good: four projects with seed companies and professional actors, supported by the competitiveness cluster Végépolys. Despite its importance in France carrot still remains a minor species with a seed activity mainly focused on the Loire Region. This plant therefore has very little chance to prevail in national/international projects. Despite this context, the Carrot team received a contract from Agriculture Department branch on genetic variability (including carotenoids), which runs until 2011, including companies as Vilmorin, Rijk Zwaan France etc…

— Participation to international or national scientific networks, existence of stable collaborations with foreign partners

The team is part of two national scientific networks but has no formal international collaborations with foreign laboratories. The team leader was nominated head of the scientific committee for the 32nd international carrot conference and of the umbellifer genetic resources ECPGR group.

— Valorization of research results and establishment of socioeconomic or cultural partnership

The team is well recognized by economic partners throughout the chain who partially support research projects. The results of current research can then rapidly be extended to the economic partners and exploited in their breeding programs.

- Appreciation on the project

— Existence, relevance and feasibility of a long term (5 years) scientific project

The project continues the two main topics of the research program conducted previously, which are (i) the genomic organization and characterization of the components of resistance to Alternaria dauci and (ii) the accumulation of carotenoids.

The team seems to have developed or is about to get the tools necessary to complete the two propose topics. However, the committee emphasizes that the two subjects are very distant from each other.

— Existence and relevance of a policy for the allocation of resource

The team will conform to the rules in the IRHS/RIHS joint unit.

— Originality and existence of cutting edge projects

The work is good and makes use of an original plant model: carrot.

- Conclusion

— Overall appreciation

This is a good/solid group that responds to questions raised by the industry concerning improving nutritional quality and low-input agriculture, especially reduction of fungicide use, which are two major traits for improving carrot business. The team should improve its international visibility by focusing on specific aspects that cannot be studied in other plants.

— Strengths and opportunities

Despite the uncertainties of performing competitive research on carotenoid biosynthesis in this system (this is a highly competitive topics), the interest of the professional actors on carotenoids and *Alternaria* resistance ensures recurrent contracts.

— Weaknesses and threats

The project lacks formal partnership developed at the European level.

— Recommendations

The committee considers that Team 6 deserves support and advises this team to:

- improve its ability to build collaborative programs at international level as well as with IRHS/RIHS Institute teams;

- increase efforts toward publishing in journals of higher impact factors;

- initiate discussions with IRH/RIHS colleagues as to better present/valorize the two topics, namely disease vs carotenoids. Also, in a longer term, the question arises about next targets of interest for carrot breeders, e.g. other metabolites? size? weight? …, and how this could be integrated in future research of the team.

Team 7: Emergence, systematics and ecology of plant pathogenic bacteria / *Emergence, systématique et écologie des bactéries phytopathogènes* (EMERSYS)

Project leader: Mrs Marie-Agnès JACQUES

- Staff members

	PAST	FUTURE
N1: Number of professors (see Form 2.1 of the unit's dossier)	Not relevant	2
N2: Number of EPST, (Public scientific and technological institution) or EPIC, (Public industrial and commercial institution) researchers (see Form 2.3 of the unit's dossier)	Not relevant	2
N3: Number of other professors and researchers (see Form 2.2 and 2.4 of the unit's dossier)	Not relevant	0
N4: Number of engineers, technicians and tenured administrative staff members (see Form 2.5 of the unit's dossier)	Not relevant	10.5
N5: Number of engineers, technicians and non-tenured administrative staff members (see Form 2.6 of the unit's dossier)	Not relevant	0
N6: Number of doctoral students (see Form 2.7 of the unit's project dossier)	Not relevant	3
N7: Number of persons accredited to supervise research and similar	Not relevant	3

- Appreciation on the results

  — Appreciation on the impact, the attractiveness of the team and of the quality of its links with international, national and local partners

The team EmerSys is the continuation of the previous team EDTa-BP (UMR PaVé) over the 2006-2010 period. This team was created in 2004 to join together scientists working on plant pathogenic bacteria. The team has now a recognized expertise in the field of bacterial plant diseases. It has acquired an international visibility, notably with the creation and management (since 1973) of the French Collection of Phytopathogenic Bacteria (CFBP), which contains about 5,400 strains (Marion Le Saux, scientific leader). The main roles of CFBP are the preservation of strains and their distribution to the scientific community. The CFBP is certified ISO 9001 since December 2008 and is qualified as an IbiSA platform.

The research mainly relates to ecology, taxonomy and phylogeny. The team members regularly conducted applied projects with private partners. There are good interactions between the CFBP resource and research projects.

The main research axes of the team are (1) epiphytic fitness and transmission to seeds, (2) plant-pathovar specificity, (3) taxonomy and phylogeny, and (4) etiology, epidemiology and emerging of bacterial diseases. The major bacterial models are Xanthomonas species. Some of the most significant results are the following:

- Transmission of bacteria to seeds by a vascular pathway needs a functional type III secretion system (TTSS). The floral pathway is used in compatible or incompatible interactions, and it is responsible for a non-host carriage of pathogens by seeds.

- A correspondence between the repertoire of candidate genes and the host-range of strains suggests a pathological convergence of phylogenetically distant isolates.

- The evolutionary history of strains gave an estimation of divergent times and revealed that transfers of virulence genes are associated with migrations.

The team production is good with 29 articles published in the past five years in international journals, with a mean IF of 2.95. Their quality is good to excellent in their specialty (*Molecular Plant-Microbe Interactions* (IF 4.41); *Applied and Environmental Microbiology* (IF 3.7); *Microbial Ecology* (IF 3.25); *Plant Pathology* (IF 2.65), *Systematic and Applied Microbiology* (IF 2.65)). In 2009, the team published two articles in more generalist journals, namely PLoS One (IF 4.35) and *BMC Genomics* (IF 3.76). One patent was also filed in 2009. Moreover, the team regularly presents its work in national or international meetings, either in oral communications (33) or in posters (37). Since 2006, four students have defended their PhD thesis.

The team is identified as a world leading team in *Xanthomonas* research. Also, the team has created the FNX network (http://www.reseau-xantho.org/) that livens up the scientific activities of laboratories working with *Xanthomonas* in France. This network funded by INRA and CIRAD allowed the team to involve the Genoscope in the sequencing of the genome of three strains of *Xanthomonas*, to manage the training of scientists and technicians for the genome annotations and to perform the annotation of the first strain *X. albilineans*. The FNX network is increasingly becoming international as scientists from Colombia, Brazil and California are joining. The team will organize the next international *Xanthomonas* Genomic Conference in 2012.

- Appreciation on the impact, the attractiveness of the research unit and of the quality of its links with international, national and local partners

As mentioned above, two team members were invited to an international conference in 2009 and to an international workshop in 2010.

The team regularly obtains financial supports at the national (3) and regional (5) levels and in partnership with private companies (3) in the frame of the competitiveness cluster Végépolys.

The team develops national and international collaborations. They are members of the French Network on *Xanthomonas* (FNX).

The CFBP is part of the network of French Biological Resource Centre (CRB) and it interacts with the International Microbial Resource Centre (CIRM).

The team was also actively involved in a European COST action.

The team benefited from the recruitment of an INRA research engineer (IR) in 2009, an INRA technician in 2008, and will benefit from the recruitment of an INRA researcher (CR2) and of an INRA technician in 2011.

- Appreciation on the strategy, management and life of the research team

The EmerSys team gathers researchers from INRA, Agrocampus Ouest and the University of Angers. Two group members obtained their HDR in 2009, increasing the management capacities of the team.

The team members regularly participate to the organization of national and international meetings such as Rencontres Plantes/Bactéries d'Aussois (2006, 2008), International Conferences on Plant Pathogenic Bacteria (2010) or International Congresses on *Pseudomonas syringae* pathovars and related pathogens (2006, 2010).

Two assistant professors significantly contribute to teaching, notably in the Plant Protection course and in the Master Plant Health and Environment. Since 2006, eight Master and five post-graduate students were supervised in the group.

- ## Appreciation on the project

The proposed projects are in continuity with the themes previously developed, with an increased importance given to the bacterial evolution and genomics. Thus, this project is based on the solid competencies acquired by the team members. Being centered on plant pathogenic bacteria, the team is interested by the host specificity, the taxonomy and phylogeny, the transmission to and by seeds, the etiology, and epidemiology of emergent diseases. The strongest axis is the bacterial adaptation to hosts, which beneficiates of several supports, human resources and external collaborations. This axis addresses general research questions relevant for the understanding of the domestication of crop plants and of emerging diseases and biological invasions. The epidemiology axis, while partly related to specific concerns of the private partners, addresses research questions very relevant in bacterial (and, more generally, plant disease) epidemiology and hardly addressed by the bacteriologists' community. A highly novel and original approach is proposed with a metagenomic investigation of the seed associated microbial community.

- ## Conclusion

— Overall appreciation

The EmerSys team is a dynamic and well-organized group with high scientific potentialities. It has an international reputation in the field of plant pathogenic bacteria, notably with the CFBP resource. The team regularly obtains funding and interacts with private partners. It has a good scientific production. The team's members have a strong involvement in international taxonomic committees and national and European plant protection authorities.

— Strengths and opportunities

The association between INRA, AgroCampus Ouest and the University of Angers is productive and leads to a strong local support linked to the competitiveness cluster Végépolys. The CFBP resource, now a world reference, is well valorized in the team research projects and toward the scientific community. Their recognized expertise in bacterial genome sequencing will favor the start and coordination of an ambitious metagenomic project toward the characterization of the bacterial communities associated with seeds. To this end, an INRA researcher will be recruited in 2011 by the team.

— Weaknesses and threats

The local collaborations are favored, perhaps at the detriment of the potential external collaborations. The new metagenomic approach is ambitious; it will need enough financial and human supports to be competitively developed.

— Recommendations

To better exploit their potentiality, the group members are encouraged to reinforce their national and international partnerships. Furthermore, considering the excellent work done and their international positioning, the committee encourages this team to pursue their effort to publish in general journals with even higher impact factors.

The team deserves unreserved support.

Team 8: Seed-borne fungal pathogens / *Pathologies fongiques des semences* (FUNGISEM)

Project leader: M. Pascal POUPARD

Assistant PI: M. Philippe SIMONEAU

- Staff members

	PAST	FUTURE
N1: Number of professors (see Form 2.1 of the unit's dossier)	Not relevant	5
N2: Number of EPST, (Public scientific and technological institution) or EPIC, (Public industrial and commercial institution) researchers (see Form 2.3 of the unit's dossier)	Not relevant	0
N3: Number of other professors and researchers (see Form 2.2 and 2.4 of the unit's dossier)	Not relevant	0
N4: Number of engineers, technicians and tenured administrative staff members (see Form 2.5 of the unit's dossier)	Not relevant	1
N5: Number of engineers, technicians and non-tenured administrative staff members (see Form 2.6 of the unit's dossier)	Not relevant	0
N6: Number of doctoral students (see Form 2.7 of the unit's project dossier)	Not relevant	1
N7: Number of persons accredited to supervise research	Not relevant	2

- Appreciation on the results

— Appreciation on the impact, the attractiveness of the team and of the quality of its links with international, national and local partners

The team FungiSem (ex CFN) developed researches on the biology of *Alternaria spp.*, seed borne necrotrophic fungi. Since 2004, the main research program concerns the determinism of the interaction between these pathogens and their host. In particular, the team worked on the identification of pathogenicity determinants related to fungal adaptation to environmental stresses. The results obtained these last four years are innovative in fungi. They showed that, in response to defense metabolites of the host- plant, the adaptive response of the fungus involves detoxification of these metabolites. This response is a component of the fungal aggressiveness towards host plants and may provide new plant protection strategies. Another program of the team concerns the study of the initial stages of plant colonization by the pathogen, *Alternaria dauci*, for the identification of the functions of host resistance QTLs. This research is conducted in collaboration with the team Carrot of the unit. The results obtained are of importance for seed production. The team has many national and international partners, and it has a leadership position in seed pathology.

— Number and quality of the publications, scientific communications, thesis and other productions

The team has a good publication record with 19 publications in international journals (*Plant Physiology, BMC Genomics, Plant Pathology*) and four book chapters. This can be considered as very good for five teachers doing research at only 50% of their time. Four students have successfully defended their PhD thesis and published their results. Members of the group have participated to many national and international conferences.

- Appreciation on the impact, the attractiveness of the research unit and of the quality of its links with international, national and local partners

  — Number and reputation of the awards obtained by staff members, including invitations to international conferences and symposia

One invitation at an international workshop is recorded in 2010.

  — Ability to recruit high level scientists, post-docs and students, particularly from abroad

One post-doctoral fellow has been working on the team project. Actually, two PhD students are included in the team.

  — Ability to raise funds, to successfully apply for competitive funding, and to participate to the elaboration of call for projects and to the activity of competitiveness clusters

The ability to obtain external funding has been good. Research of the team was supported by five academic national research contracts and three collaborative programs involving seed companies.

  — Participation to international or national scientific networks, existence of stable collaborations with foreign partners

Members of the team participated to projects in collaboration with foreign partners: China and different European countries.

  — Valorization of research results and establishment of socioeconomic or cultural partnership

The team regularly conducted programs with seed companies.

- Appreciation on the strategy, management and life of the research team

The team includes only professors and assistant professors who spend about half-time in teaching activities. They manage several courses at the University of Angers at the Licence and Master levels. The team assistant manager is the director of the SFR Quasav and he highly participated to the structuration of the local research.

- Appreciation on the project

  — Existence, relevance and feasibility of a long term (5 years) scientific project

The research of the team on adaptive responses to chemical stresses will be completed by the search for i) molecular targets of antifungal metabolites and ii) plant defense potentiators. These programs will be carried out in collaboration with national and international partners.

The team project will mainly focus on transmission of pathogens by seeds. The principal scientific issue will be the link between the adaptive responses of the pathogen and the seed colonization. Analysis of the fungal and seed transcriptomes during colonization will be studied on the *Arabidopsis thaliana* / *Alternaria brassicicola* model pathosystem. This main project is original and of interest to determine key pathogenic determinants and new plant protection strategies.

— Existence and relevance of a policy for the allocation of resource

The team will conform to the policy of the IRHS/RIHS Institute.

- Conclusion

— Overall appreciation

The results obtained by the team FungiSem on chemical stresses are innovative, even if some hypotheses were unsuccessful. The rate of publication is very good. The project focuses on seed transmission; it is well constructed and of interest.

— Strengths and opportunities

The team has a leadership on seed pathology.

— Weaknesses and threats

No obvious weaknesses.

— Recommendations

The technical support of this team should be improved.

The program on *Alternaria dauci* should be included in the project of Team 6.

The team deserves unreserved support.

Team 9: Mitochondria and stress / *Mitochondries et stress* (MITOSTRESS)

Project leader: M. David MACHEREL

- Staff members

	PAST	FUTURE
N1: Number of professors (see Form 2.1 of the unit's dossier)	Not relevant	3
N2: Number of EPST, (Public scientific and technological institution) or EPIC, (Public industrial and commercial institution) researchers (see Form 2.3 of the unit's dossier)	Not relevant	0
N3: Number of other professors and researchers (see Form 2.2 and 2.4 of the unit's dossier)	Not relevant	0
N4: Number of engineers, technicians and tenured administrative staff members (see Form 2.5 of the unit's dossier)	Not relevant	2
N5: Number of engineers, technicians and non-tenured administrative staff members (see Form 2.6 of the unit's dossier)	Not relevant	1
N6: Number of doctoral students (see Form 2.7 of the unit's project dossier)	Not relevant	1.5
N7: Number of persons accredited to supervise research	Not relevant	2

- Appreciation on the results

  — Appreciation on the impact, the attractiveness of the team and of the quality of its links with international, national and local partners

The team found a highly original niche by focusing its research on the physiological and metabolic properties of mitochondria from plant seeds and on their ability to function under extreme stress conditions. They obtained innovative results that concern:

(i) By using highly original and complementary approaches of biophysics, structural biochemistry and reverse genetics, they revealed remarkable structural and functional properties of a mitochondrial LEA protein. This matrix protein is able to protect inner membrane in the dry state. These studies have been published in The Plant Cell, and selected by the network "Faculty of 1000", and in *BBA Biomembranes*;

(ii)Structural and functional studies of LEA proteins from a micro-invertebrate, a bdelloid rotifers, which led to a publication in *Science* in collaboration with A. TUNNACLIFFE (Cambridge, UK) and D. HINCHA (Potsdam, Germany);

(iii)The team has demonstrated that pea seed mitochondria function at extreme temperatures (-3.5 to 40°C) (published in *Plant Physiology,* and *Plant Physiology* coverage);

(iv) Study on the regulation of mitochondrial function by a NO-nitrite cycle under physiological conditions close to anoxia (publications in *New Phytologist* and *BBA Biomembranes*).

This team is one of the few to work on plant mitochondria in France and appears as a leader group at the international level in the field of plant mitochondriology and seed biology. This reputation is reflected by invitations to write review articles, book chapters and by invitations to major international conferences.

— Number and quality of the publications, scientific communications, thesis and other productions

The team produced 12 publications that can be qualified as excellent to exceptional (according to the criteria referenced by INRA) since they concern: 1 *Science* (IF 29.8), 1 *Plant Cell* (IF 9.3), 1 *Plant Physiol* (IF 6.2), 1 *New Phytol* (IF 6.0), 1 *Plant Cell Environ* (IF 5.1), 1 *BBA-Biomembranes* (IF 4), 1 *BBA Bioenergetics* (IF 3.7), 1 *BMC Genomics* (IF 3.7), 1 *Biology Direct* (IF 3.3), 2 reviews (in *Ann Bot*, IF 3.5, and *Physiol Plant*, IF 2.7) and 1 book chapter. The scientific production, given the size of the team and the fact that its members are all professors or associate professors, is exceptional. All the team scientific members are '*produisants*'.

These publications have had a real impact on the scientific community: some of them published just three years ago are already cited dozens of times.

One thesis was defended during the last four-year contract and has resulted in four publications; the PhD student was first author in two of them (1 *Plant Cell* and 1 *BBA membranes*). Two theses are underway in the team.

Two public databases have been produced: "The disulfide bridge db" & "LEAP db. The LEAP db, which contains 710 LEA protein sequences, provides analysis tools dedicated for study structure-function relationships of LEA proteins.

- Appreciation on the impact, the attractiveness of the research unit and of the quality of its links with international, national and local partners

— Number and reputation of the awards obtained by staff members, including invitations to international conferences and symposia

Four invitations to international conferences.

— Ability to recruit high level scientists, post-docs and students, particularly from abroad

This ability is relatively good since an associate professor has joined the team recently.

— Ability to raise funds, to successfully apply for competitive funding, and to participate to the elaboration of call for projects and to the activity of competitiveness clusters

The ability to obtain external funding has been good, as the TAS team has obtained four contracts since 2006. A funding from a private company (Danone) was also successfully obtained.

— Participation to international or national scientific networks, existence of stable collaborations with foreign partners

Existence of major collaborations with foreign laboratories has resulted in the publication of four articles (in *Science, Plant Physiol, New Phytologist* and *BBA Bioenergetics*). The 'Mitostress' and 'Conserto' teams with outstanding European scientists have initiated a lobbying action at the EC level for a FP7 KBBE call.

— Valorization of research results and establishment of socioeconomic or cultural partnership

- Creation and management of a website dedicated to the dissemination of scientific results.

- Participation in cultural activities (press conference, scientific debate, café des sciences...)

- Articles in local newspapers: 'Courier de l'Ouest' and 'Ouest France'.

Contract with private company (Danone).

- Appreciation on the strategy, management and life of the research team

All the scientists are teachers.

- Appreciation on the project

— Existence, relevance and feasibility of a long term (5 years) scientific project

Existence of an ambitious project that continues the outline of the research program conducted during the previous four years which is to understand the molecular mechanisms that allow seed mitochondria to function under stress conditions.

— Existence and relevance of a policy for the allocation of resource

It has been clearly exposed that research funding will be made to recruit staff (PhD students and post-docs) to ensure that all project themes are addressed. Some of these topics will not be developed if funding is not obtained.

— Originality and existence of cutting edge projects

The ability of mitochondria to resist to seed desiccation and "extreme" temperatures will be addressed in particular by an original study of the stress LEA and sHSP proteins.

- Conclusion

— Overall appreciation

The quality and originality of the research of this team were clearly at high international standard. This team has an excellent visibility at the national and international levels.

— Strengths and opportunities

- Recognized expertise of the team in the field of plant mitochondriology and seed biology.

- Exceptional papers have been published.

- The project is very good and is based on excellent starting points.

- The group has a very efficient international partnership with excellent foreign laboratories.

— Weaknesses and threats

The ability to raise funds shall be improved.

— Recommendations

Successful collaborations with excellent foreign teams are encouraged to maintain an excellent level of publications.

The ability to raise funds shall be improved.

This excellent team needs and deserves strong support.

Team 10: Seed conservation and desiccation tolerance / *Conservation et tolérance à la dessiccation des semences* (CONSERTO)

Project leader: Mrs Julia BUITINK

- Staff members

	PAST	FUTURE
N1: Number of professors (see Form 2.1 of the unit's dossier)	Not relevant	2
N2: Number of EPST, (Public scientific and technological institution) or EPIC, (Public industrial and commercial institution) researchers (see Form 2.3 of the unit's dossier)	Not relevant	1
N3: Number of other professors and researchers (see Form 2.2 and 2.4 of the unit's dossier)	Not relevant	0
N4: Number of engineers, technicians and tenured administrative staff members (see Form 2.5 of the unit's dossier)	Not relevant	3
N5: Number of engineers, technicians and non-tenured administrative staff members (see Form 2.6 of the unit's dossier)	Not relevant	0
N6: Number of doctoral students (see Form 2.7 of the unit's project dossier)	Not relevant	2
N7: Number of persons accredited to supervise research and similar	Not relevant	2

- Appreciation on the results

The team has a long-standing expertise in the study of desiccation tolerance and longevity in seeds. They provided novel and interesting results on stress proteins, such as LEA (late embryogenesis abundant) proteins, which are highly hydrophilic, intrinsically disordered proteins that are associated abiotic stress, but whose function remains enigmatic (*Plant Physiol* 2006; ACL3). One such LEA protein that correlated with the acquisition and loss of longevity was patented for its use as a marker for seed survival in the dry state. In addition, this team characterized the mechanisms involved in seed desiccation tolerance and longevity during maturation using transcriptomics coupled to proteomics and metabolomics (*Plant* J 2006; ACL4). The redox status of proteins was studied during seed maturation and germination to investigate a possible link between protein oxidation and seed quality (*Plant Physiol* 2007; ACL10). A detailed comparative analysis between desiccation tolerant and sensitive tissues has been undertaken, including the sequencing of the transcriptome of a desiccation-sensitive seed of the legume *C. australe* by Solexa. To further identify factors involved in longevity in *M. truncatula*, a quantitative genetics approach was coupled to a transcriptomics and PQL (protein quantitative loci) approach on LEA proteins and other stress-related proteins, and identified ABI5 as an important regulator of maturation. A seed maturation gene, *MtSNF4b,* was found to play a key role in oligosaccharide accumulation, the acquisition of longevity and defense gene expression in relation to seed dormancy (*Plant J* 2007; ACL8 and *Plant* J 2010; ACL19). A PQL analysis suggests that this gene is regulated by ABI5.

In the past four years, the team had produced 14 peer-review publications in good to excellent journals of the specialty (*Plant Journal, Plant Physiology*….), plus one World patent on the use of a seed specific LEA protein EM6 as a germination performance marker. Seven master students were trained and four students have successfully defended their PhD thesis (and one is running). Most PhD students are now on a postdoctoral stay or even found permanent positions. Members of the group were implicated in organizing national conferences, and were very active toward the creation of the French National Network on Seeds.

- Appreciation on the impact, the attractiveness of the team and of the quality of its links with international, national and local partners

The team leader is associate editor of *Seed Science Research* since 2008.

— Number and quality of the publications, scientific communications, thesis and other productions

The team can be credited of:

14 publications that can be qualified as excellent according to the international criteria of reference: 3 *Plant Physiology* (IF 6.98), 3 *Plant journal* (IF 6.946), 2 *Plant Cell Env* (IF 5.081), 1 J *Exp Bot* (IF 4.271), 1 J *of Proteomics* (IF 3.851), 1 *Plant Science* (IF 2.05), 1 *Functional Plant* Biol (IF 1.678), 1 *Seed Sci Res* (IF 1.608);

- six commissioned books chapters;

- three invitations for plenary lectures in international symposia, 18 communications in international conferences, and 15 posters;

- four PhD defended (F Alkhalfioui, C Rosnoblet, W Bolingue, V Boucher), while one more is under way. It is noted that all PhD students have at least one publication as first author.

- Appreciation on the impact, the attractiveness of the research unit and of the quality of its links with international, national and local partners

Team members were invited to three international conferences and have presented 18 communications and 15 posters at national and international conferences.

The team has successfully obtained funding for several competitive calls in many regional, national and international programs. The committee appreciated the international visibility of the team in the field of seed stress tolerance and longevity.

— Number and reputation of the awards obtained by staff members, including invitations to international conferences and symposia

See above.

— Hability to recruit high level scientists, post-docs and students, particularly from abroad

One post-doc recruited.

— Hability to raise funds, to successfully apply for competitive funding, and to participate to the elaboration of call for projects and to the activity of competitiveness clusters

Efficient: two AIP INRA projects; regional projects COSAVE, QUALISEM (leader), Phosphosave, one national ANR Qualitylegseed (partner).

— Participation to international or national scientific networks, existence of stable collaborations with foreign partners

See above and project FP7-Eurogenbank submitted in 2010. Collaboration with Kew garden for genebanks, with South Africa on recalcitrant *C. australe* seeds.

— Valorization of research results and establishment of socioeconomic or cultural partnership

One world patent filed: Utilization of protein EM6 as marker of seed quality. Permanent contacts with the regional Végépolys network.

- Appreciation on the strategy, management and life of the research team

— Relevance of the research team organization, quality of the management and of the communication policy

Very good, see above.

— Relevance of the initiatives aiming at the scientific animation and at the emergence of cutting edge projects

Very good, see above.

— Contribution of the research team staff members to teaching and to the structuration of the research at the local level

Two teachers out of three scientists, two having their HDR. The team is strongly implicated in Agrocampus Ouest and Angers University teaching , especially at the master level.

Appreciation on the project

— Existence, relevance and feasibility of a long term (5 years) scientific project

The presented project is a general continuation of the themes developed by this group. The proposed reorganization of the team should not affect its scientific productivity. The new Team 10 will concentrate on the mechanisms of desiccation tolerance and seed longevity of *M. truncatula* seeds by defining the gene regulatory networks –1- driving the maturation of the seeds; –2- involved in desiccation tolerance; –3- controlling seed longevity.

The committee considers that these projects are original, competitive at the international level and deserve support.

— Existence and relevance of a policy for the allocation of resource

The project is funded, but obtaining asked EU support would be welcome.

— Originality and existence of cutting edge projects

See above.

- Conclusion

— Overall appreciation

This is a very motivated team with three permanent scientists, one INRA engineer, one INRA technician, one post-doc and two PhD students. This team has an international reputation in the study of seed stress tolerance, notably desiccation tolerance and seed longevity. The team was successful in obtaining good funding from several sources. Excellent papers have been published.

— Strengths and opportunities

- Internationally recognized expertise in the their domain

- Excellent scientific production

- The project is realistic and pertinent

- The team has a very good international and national partnership and is strongly rooted in the IHRS/RIHS and local industrial networks.

— Weaknesses and threats

Funding is probably a little too local and the team is encouraged to apply to national, European and international calls for projects.

The team clearly needs scientist reinforcement and further technical support to be able to fully develop its projects.

— Recommendations

To further develop the international partnership for funding and recruit high-quality post-doc fellows and scientists.

This team needs and fully deserves strong support.

Team 11: Biology of germination and seedling emergence / *Biologie de la germination et de la levée* (BGL)

Project leader: Mrs Carolyne DÜRR

- Staff members

	PAST	FUTURE
N1: Number of professors (see Form 2.1 of the unit's dossier)	Not relevant	3
N2: Number of EPST, (Public scientific and technological institution) or EPIC, (Public industrial and commercial institution) researchers (see Form 2.3 of the unit's dossier)	Not relevant	0
N3: Number of other professors and researchers (see Form 2.2 and 2.4 of the unit's dossier)	Not relevant	0
N4: Number of engineers, technicians and tenured administrative staff members (see Form 2.5 of the unit's dossier)	Not relevant	2
N5: Number of engineers, technicians and non-tenured administrative staff members (see Form 2.6 of the unit's dossier)	Not relevant	1
N6: Number of doctoral students (see Form 2.7 of the unit's project dossier)	Not relevant	1.5
N7: Number of persons accredited to supervise research	Not relevant	3

- Appreciation on the results

The team was created in 2006 around the experience of his leader on crop stand establishment, which was based on the development of the SIMPLE model (SIMulation of Plante Emergence, Dürr et al., 2000). This model, which predicts germination and emergence depending on sowing conditions (soil, T°, humidity), is generic and can be run to predict emergence of all species. So, It has been used for crops, weeds and volunteers (eg., publication in *Ecol Modeling,* 2007; ACL26). Evidently, the parameter values of the model vary for seeds and seedlings according to plant characteristic (species, genotypes and seed lots). The main objectives of the group are to distinguish in the variations of emergence the part of the environment of the seedbed from the part linked to plant characteristics.

Over the period, the team continued a strong collaboration with UMR Biology and Weed management (INRA Dijon) on crop and weed emergence and developed within the PMS Unit seed and seedling characterization for legume crops (in collaboration with colleagues of ESA Angers), as well as on *Medicago truncatula*. This model species was used to investigate the genetic and molecular determinism of seedling emergence (Ann Bot, 2009; ACL 31). To reach this last objective the development of automated methods for phenotyping seeds and seedlings were developed with SNES-GEVES.

Working on *M. truncatula* allows combining the agronomic and genetic skills to unravel the molecular determinism of emergence variations. Using the Simple model allowed to characterize six genotypes, varying in their emergence behaviors. These genotypes became parents of populations of recombinant inbred lines (RILs). Then the populations of RILs were phenotyped for tolerance to extreme T°, water stress, seed mass, hypocotyl length…. QTL were detected for seed mass, seed imbibition and germination rates, hypocotyl growth at low T° under moderate water stress, non-reducing sugar contents (*Theor Appl Genet*, 2010; ACL33; collaboration with INP-ENSAT-INRA Toulouse).

This approach should allow the identification of genes specific to each stage of seed development that could provide reliable markers for assisting selection and improving crop establishment. An initial set of putative candidate genes was identified in the light of the role of abscisic acid/gibberellin balance in regulating germination at high temperatures (e.g. ABI4, ABI5), the molecular cascade in response to cold stress (e.g. CBF1, ICE1) etc.

However, nothing is said on the way to identify the putative genes underlying the QTLs but the team planned transcriptome profiling during heterotrophic hypocotyl growth in help to identify genes differentially expressed at extreme temperatures in different genotypes. These sets of genes could be then compared with the candidate genes selected, and more generally to all genes positioned in the QTL support intervals.

In the past four years, the team had a good publication track record with 14 peer-review publications in excellent to good journals (*Ecological modeling*, *Annals of Botany*, *Theoretical* and *Applied Genetics, European Journal of Agronomy* etc…). Three masters students were trained and three students have successfully defended their PhD thesis. Most PhD students are now on a postdoctoral stay or even found a permanent position.

— Appreciation on the impact, the attractiveness of the team and of the quality of its links with international, national and local partners

Team members have presented several posters at national and international conferences. The committee appreciated the national and international visibility of the team in the field of seed ecophysiology and the work done to strengthen the partnership of UMR PMS with technical institutes such as GEVES-SNES.

— Number and quality of the publications, scientific communications, thesis and other productions

The team produced:

- 14 publications that can be qualified as excellent to good according to the international criteria: 1 Annals of Botany (IF 3.501), 1 *Theoretical and Applied Genetics* (IF 3.36), 1 *Soil and Tillage Research* (IF 2.883), 5 *European Journal of Agronomy* (IF 2.419), 2 *Weed Research* (IF 2.033) 2 *Ecological Modeling* (IF 1.871), 1 *Biologia plantarum* (IF 1.656), 1 *Seed Science Research* (IF 1.608);

- two book chapters;

- eight talks in international congresses;

- 17 posters.

One PhD thesis and one PhD thesis in co-direction have been defended. These theses resulted in at least one publication with the PhD student as first author.

— Quality and stability of partnerships

There exists a strong partnership with SNES/GEVES, which as mentioned above is an essential component of the scientific work of the team.

- Appreciation on the impact, the attractiveness of the research unit and of the quality of its links with international, national and local partners

— Hability to recruit high level scientists, post-docs and students, particularly from abroad

The team succeeded in attracting two confirmed scientists (MC) from ESA Angers in its project. A foreign post-doc recruitment is planned. Three PhD are underway in co-direction with other teams of the SFR.

— Hability to raise funds, to successfully apply for competitive funding, and to participate to the elaboration of call for projects and to the activity of competitiveness clusters

The team has successfully obtained funding for numerous competitive calls in many regional and national programs: one ANR contract Qualitylegsem - four regional contracts Novanol, Cosave, Qualisem, Phenotic), three “branch contracts” (Ministry of Agriculture), one contract growers (Semgren). The team is leader for the contract Phenotic, which sustains one of the most significant and structuring projects of the SFR QUASAV.

The team has been labeled “Jeune Equipe / Young Team” INRA.

— Participation to international or national scientific networks, existence of stable collaborations with foreign partners

Not relevant, except past work on volunteers in rapeseed. To be developed, especially in the context of the Phenotic project. An international ANR project Plant KBBE has been recently funded.

— Valorization of research results and establishment of socioeconomic or cultural partnership

Most of the projects are developed with regional socioeconomics partners. The Phenotic project is especially relevant to partnership with growers and seed industry.

- Appreciation on the strategy, management and life of the research team

— Relevance of the research team organization, quality of the management and of the communication policy

Team organization seems adequate, reaching the objectives. Results were successfully published.

— Relevance of the initiatives aiming at the scientific animation and at the emergence of cutting edge projects

Development of the Phenotic project has to be underlined.

— Contribution of the research team staff members to teaching and to the structuration of the research at the local level

Three scientists are teachers in ESA (Ecole Supérieure Agronomique / Agronomy High Scholl) Angers or Angers University. Their integration in Team 11 and IRHS/RIHS Institute will contribute to teaching excellence in ESA Angers and University.

- Appreciation on the project

— Existence, relevance and feasibility of a long term (5 years) scientific project

The project presented by Team 11 "Biology of germination and seed emergence" is a continuation of the themes developed before by Team E2 of UMR PMS on seed germination and emergence. With the creation of the new IRHS/RIHS, Team 11 proposes to:

1. pursue the agronomic analysis of crop emergence and its relations with seeds characteristics taking into account changes in climate (increasing T°), in cropping systems (mixed crops, decrease in phytoprotection) and effects of breeding (seed germination and emergence of oilseed rape genotypes with different lipid composition). Reaching point 1 needs developing a phenotyping platform for the characterization of seeds and seedlings. Tools developed will be valorized and extended to phenotyping of the architecture of various plant species. This last point will contribute to the programs from others teams in IRHS, eg those working on woody plants;

2. develop the analysis of genetic and molecular determinism of seed emergence with the objectives of discovering molecular markers for breeding emergence, for seed lot evaluation (tolerance to cold and water stress).

The committee agrees with these objectives because point 1 is of great agronomic valuend plant phenotyping is a real cutting edge project. Point 2 seems attainable because of the recent recruitments of two scientists specialized in molecular biology and genetic and the collaborations developed inside and outside of IRHS.

The committee considers that these projects are original, competitive at the international level and deserve support.

— Existence and relevance of a policy for the allocation of resource

The proposed works seem to be funded, Phenotic and Qualisem contracts ended in 2013.

— Originality and existence of cutting edge projects

The committee has pointed the relevance of the Phenotic project. Also discovering the molecular basis of seedling emergence after QTL determination is of major interest.

- Conclusion

— Overall appreciation

This is a very motivated team with 5 permanent scientists and 2.5 technicians. This team has an international reputation in the study of seed germination and seed emergence in crop stand establishment. The team was successful in obtaining good funding from several sources. Excellent papers have been published. Efficient partnerships have been developed with SNES/GEVES and within the IRHS/RIHS Institute; the integration in an international ANR Plant KBBE project is underway.

— Strengths and opportunities

The development of a phenotyping platform will fertilize the regional research and teaching environment. This will give opportunity in developing international partnerships and funding. The context of IRHS will very probably allow the success in the molecular projects (QTLs identifications), and others, of Team 11.

— Weaknesses and threats

The team was reinforced recently with geneticists and molecular biologists. However, the IRHS/RIHS Institute should be aware of the tremendous amount of work and incomes needed by the whole development of the high-potential Phenotic project. Some competitors do exist in this field, see for instance, http://www.keygene.com/documents/Press Release_120111.pdf.

— Recommendations

The committee does not see very clearly how the important work dealing with the determination of QTLs of seed emergence will be valorized. A strategy has to be defined in the team, and/or at the level of the IRHS/RIHS to identify the putative genes underlying these QTLs. Cloning a QTL is not an easy task.

This team deserves unreserved support.

Team 12: Nitrogen, seedling - establishment and abiotic stress / *Azote, levée et stress abiotique* (ALSA)

Project leader: M. Anis LIMAMI

- Staff members

	PAST	FUTURE
N1: Number of professors (see Form 2.1 of the unit's dossier)	Not relevant	4
N2: Number of EPST, (Public scientific and technological institution) or EPIC, (Public industrial and commercial institution) researchers (see Form 2.3 of the unit's dossier)	Not relevant	0
N3: Number of other professors and researchers (see Form 2.2 and 2.4 of the unit's dossier)	Not relevant	0
N4: Number of engineers, technicians and tenured administrative staff members (see Form 2.5 of the unit's dossier)	Not relevant	3
N5: Number of engineers, technicians and non-tenured administrative staff members (see Form 2.6 of the unit's dossier)	Not relevant	0
N6: Number of doctoral students (see Form 2.7 of the unit's project dossier)	Not relevant	2
N7: Number of persons accredited to supervise research and similar	Not relevant	2

- Appreciation on the results

— Appreciation on the impact, the attractiveness of the team and of the quality of its links with international, national and local partners

The team has studied the early stages of the establishment of seedlings after germination by focusing its research on two aspects:

- Control of the primary root growth by studying (i) the participation of the enzymes involved in the cell wall biosynthesis in this phenomenon (1 publication in *Molecular Plant*) and (ii) the role of nitrogen and the involvement of a transporter of nitrate (MtNRT1.1).

- Analysis the nitrogen metabolism modulations during water stress and hypoxic (2 publications in *Journal of Experimental Botany)*.

— Number and quality of the publications, scientific communications, thesis and other productions

The quantity and quality of the publications is good. Eleven publications have been published by a team made of four scientists with teaching duties including four papers in J Exp Bot (IF 4.3), one paper in *Molecular Plant* (IF 2.8), two papers in J *Plant Physiol* (IF 2.5), one paper in *Gene* (IF 2.4) and a book chapter.

- Appreciation on the impact, the attractiveness of the research unit and of the quality of its links with international, national and local partners

  — Number and reputation of the awards obtained by staff members, including invitations to international conferences and symposia

The team leader was invited for a two-month stay as 'visiting professor' at the University of Alberta, Edmonton (Canada).

  — Ability recruit high level scientists, post-docs and students, particularly from abroad

The team is attractive since two PhD students, on average, are regularly present in the group.

  — Ability to raise funds, to successfully apply for competitive funding, and to participate to the elaboration of call for projects and to the activity of competitiveness clusters

The team's ability to raise funding is good since it successfully participated as a partner to four granted projects: an European project (Grain Legume integrated project), one Génoplante Project (Qualitylegseed) and two projects funded by the Region Pays de la Loire (Cosave and Qalisem).

  — Participation to international or national scientific networks, existence of stable collaborations with foreign partners

The team participated as a partner in the European program FP6 Grain Legume Integrated Project "New Strategies to Improve Grain Legumes for Food and Feed."

  — Valorization of research results and establishment of socioeconomic or cultural partnership

- The team maintains partnerships with two private organizations. However, the financial aspects were not specified in the report.

- Interview and article in the local newspaper "Courier de l'Ouest".

- Appreciation on the strategy, management and life of the research team

The team is made of four scientists with teaching duties.

- Appreciation on the project

  — Existence, relevance and feasibility of a long term (5 years) scientific project

The project seems too ambitious considering the size of the team.

  — Existence and relevance of a policy for the allocation of resource

There is a clear policy for the allocation of resource, notably at the regional level.

  — Originality and existence of cutting edge projects

The study of the nitrate metabolism modulation as function of different stresses (hypoxia and drought) using isotopic labeling coupled to GC/MS-MS is quite original.

- Conclusion

— Overall appreciation

It is a good team that published good but not exceptional papers. This is however meritorious because this team is only composed of scientists with teaching duties. The team was successful in obtaining substantial funding from several sources.

— Strengths and opportunities

The team has a good expertise on nitrogen metabolism.

— Weaknesses and threats

- The team potential does not seem to be fully exploited.

- Available modern genomics tools should better be used on a regular basis.

- The team should try publishing in journals with higher impact factors.

- The ability of some team members to publish shall be improved.

— Recommendations

The team should reduce its points of interest by focusing its research on some key topics that can be studied more thoroughly with the aim to publish articles with higher impact factors.

The team should develop collaborations with teams of the future IRHS institute and externally with INRA teams that have demonstrated expertise on nitrate transporters (perhaps via ANR application). The study of MtNRT1.1 would be interesting if specificities of this transporter in *Medicago Truncatula* could be evidenced otherwise there is little interest to repeat experiments that have already been done in *Arabidopsis thaliana*.

The team should elaborate more on the importance of nitric oxide in seed germination/seedling establishment as an integral part of nitrogen metabolism. Although this is an interesting aspect, considering the major advances published in recent years, this is a quite a competitive field and as for nitrogen transporters would benefit from the establishment of collaborations at national and international levels (e.g., INRA IJPB for *Arabidopsis* studies). Again, the team should take care not to simply reproduce in *Medicago truncatula* what has been published in other plants, but concentrate on specific aspects exhibited by legume seeds.

Globally this team deserves support.

Intitulé UR / équipe	C1	C2	C3	C4	Note globale
INSTITUT DE RECHERCHE EN HORTICULTURE ET SEMENCES (IRHS)	A	A	A+	A+	A
CARROT QUALITY AND RESISTANCE TO BIO AGGRESSORS / QUALITÉ ET RÉSISTANCE AUX BIOAGRESSEURS CHEZ LA CAROTTE / (CARROT), [RENOU-BRIARD-JOFFRIAU.]	A	B	Non noté	B	B
SEED STORAGE AND DESICCATION TOLERANCE/ CONSERVATION ET TOLÉRANCE À LA DESSICCATION DES SEMENCES [RENOU-BUITINK]	A+	A+	Non noté	A	A+
APPLE AND PEAR RESISTANCE TO DISEASES AND PESTS / RÉSISTANCE DU POMMIER-POIRIER AUX PATHOGÈNES (RESPOM), [RENOU-DUREL-BRISSET]	A	A	Non noté	A	A
BIOLOGY OF GERMINATION AND SEEDLING EMERGENCE / BIOLOGIE DE LA GERMINATION ET DE LA LEVÉE [RENOU-DÜRR]	A	B	Non noté	B	B
GENETIC DETERMINISM AND DIVERSITY IN ORNAMENTALS / DÉTERMINISME GÉNÉTIQUE ET DIVERSITÉ DES PLANTES ORNEMENTALES (GDO [RENOU-FOUCHER-GRAPIN]	A	B	Non noté	B	B
EMERGENCE, SYSTEMATICS AND ECOLOGY OF PLANT PATHOGENIC BACTERIA (EMERSYS) [RENOU-JACQUES]	A	A+	Non noté	A+	A
FRUIT QUALITY / QUALITÉ DES FRUITS (FRUITQUAL), [RENOU-LAURENS]	A	A+	Non noté	A+	A
EVOLUTIONARY ECOLOGY IN FUNGI (ECOFUN) / ECOLOGIE EVOLUTIVE CHEZ LES CHAMPIGNONS. [RENOU-LE CAM]	A	A	Non noté	A	A
AZOTE LEVÉE ET STRESS ABIOTIQUE - NITROGEN, SEEDLING - ESTABLISHMENT AND ABIOTIC STRESS [RENOU-LIMAMI]	A	B	Non noté	B	B
MITOCHONDRIA AND STRESS/ MITOCHONDRIES ET STRESS [RENOU-MACHEREL]	A+	A+	Non noté	A	A+
SEED-BORNE FUNGAL PATHOGENS / PATHOLOGIES FONGIQUES DES SEMENCES (FUNGISEM) [RENOU-POUPARD]	A	A	Non noté	A	A
INTEGRATIVE BIOLOGY OF ARCHITECTURE WITHIN ENVIRONMENT (ARCH-E)I : [RENOU-SAKR]	B	B	Non noté	A	B

C1 Qualité scientifique et production

C2 Rayonnement et attractivité, intégration dans l'environnement

C3 Gouvernance et vie du laboratoire

C4 Stratégie et projet scientifique

Statistiques de notes globales par domaines scientifiques

(État au 06/05/2011)

Sciences du Vivant et Environnement

Note globale	SVE1_LS1_LS2	SVE1_LS3	SVE1_LS4	SVE1_LS5	SVE1_LS6	SVE1_LS7	SVE2 _LS3 *	SVE2_LS8 *	SVE2_LS9 *	Total
A+	7	3	1	4	7	6		2		30
A	27	1	13	20	21	26	2	12	23	145
B	6	1	6	2	8	23	3	3	6	58
C	1					4				5
Non noté	1									1
Total	**42**	**5**	**20**	**26**	**36**	**59**	**5**	**17**	**29**	**239**
A+	16,7%	60,0%	5,0%	15,4%	19,4%	10,2%		11,8%		12,6%
A	64,3%	20,0%	65,0%	76,9%	58,3%	44,1%	40,0%	70,6%	79,3%	60,7%
B	14,3%	20,0%	30,0%	7,7%	22,2%	39,0%	60,0%	17,6%	20,7%	24,3%
C	2,4%					6,8%				2,1%
Non noté	2,4%									0,4%
Total	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%

*** les résultats SVE2 ne sont pas définitifs au 06/05/2011.**

Intitulés des domaines scientifiques

Sciences du Vivant et Environnement

- **SVE1 Biologie, santé**
  - **SVE1_LS1 Biologie moléculaire, Biologie structurale, Biochimie**
  - **SVE1_LS2 Génétique, Génomique, Bioinformatique, Biologie des systèmes**
  - **SVE1_LS3 Biologie cellulaire, Biologie du développement animal**
  - **SVE1_LS4 Physiologie, Physiopathologie, Endocrinologie**
  - **SVE1_LS5 Neurosciences**
  - **SVE1_LS6 Immunologie, Infectiologie**
  - **SVE1_LS7 Recherche clinique, Santé publique**
- **SVE2 Ecologie, environnement**
  - **SVE2_LS8 Evolution, Ecologie, Biologie de l'environnement**
  - **SVE2_LS9 Sciences et technologies du vivant, Biotechnologie**
  - **SVE2_LS3 Biologie cellulaire, Biologie du développement végétal**

JRUs GenHort, PaVe, PMS and SAGAH,
Merging in the IRHS (01-01-2012)
42 Rue G Morel, 49071 Beaucouzé CEDEX, Fr

Angers, 13th April, 2011

Reply to the AERES Evaluation Report

The laboratory would like to thank the reviewing committee for their positive and constructive remarks. We appreciate the recommendations to the direction and research teams which will be very helpful to finalize the IRHS project.

In accordance with the suggestions, the functional organization of the new teams has significantly progressed since the visit of the committee. We precise that, over the past years, the Arch-E team had already focused its efforts on rose, which is now its unique model. Since a driving principle of the laboratory is that research teams should remain functional entities, we are not in favor of merging large teams as evoked for teams 1-2 in the report. Meanwhile we are aware that more links need to be developed between teams. This point constitutes a daily consideration which already led to emerging collaborations within the Institute in 2011 on several new topics such as relationships between plant architecture and pathogen responses, presuming a fast evolution during the first years following the birth of the IRHS. Already the regional Qualisem project is funding collaborative research on the link between seed physiological and sanitary quality.

Quality management, publication strategy, ability to raise funds and accurate recognition of the technical staff regarding the publications, are also major issues for which the reflection has progressed significantly, with the aim to reach a common policy in the Institute.

Considering the current geographical dispersion identified by the committee as the major threat, we are now aware that the new building "Campus du Végétal" will be delivered in late 2014, allowing to gather all teams of IRHS on the same site in 2015.

Elisabeth CHEVREAU	Vincent GUERIN	Olivier LEPRINCE	Charles MANCEAU
UMR GenHort	UMR SAGAH	UMR PMS	UMR PaVé

Jean Pierre RENOU
IRHS