



ANNUAL REPORT 2019

French Variety and Seed Study and Control Group



GEVES
Expertise & Performance

Society has high demands for agriculture and downstream industries, which will largely impact the seed and plant sector. Genetic improvement and high-quality seed and plants contribute to the necessary changes in agricultural production systems to support productivity, sustainability, product quality, environmental quality and public health.

GEVES, a national examination office, implements research projects and public policies on varieties, seeds and plants. A key actor in the agricultural and ecological transition, GEVES has an essential role to play in defining agriculture for tomorrow. This includes drawing on its own scientific and technical expertise and the expertise of its founding members, and accepting the controversy and confusion surrounding technology and models for production and protection.

Through its missions as a national reference laboratory, and its responsibilities in the development of methods and international standards, GEVES has a major recognised role in guaranteeing the quality of seeds which are used in France or exported.

GEVES continues to develop its activities relating to plant genetic resources. Major advances are underway to establish a specific endowment fund for plant genetic resources, and to set up networks at national level.

GEVES also has a growing international dimension in many fields such as research, with the launch of the European project INVITE, cooperation in variety testing with 17 countries in West Africa with the OAPI program, and the expansion of its capacities in the ornamental sector following the UK's departure from the EU.

Enhancing data, providing tools for professionals, and disseminating information as widely as possible are major priorities for GEVES.

GEVES continues to organise its teams, acquire new skills, and implement resources in line with its objectives. This development also concerns its staff representative bodies, which have been completely reformed and unified as of 1 January 2020.

We would like to thank our partners for their confidence, and the GEVES staff for their investment, thanks to which GEVES continues to demonstrate its expertise and performance. We hope you enjoy reading this annual report.



Christian HUYGHE,
President



Alain TRIDON,
CEO

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2019 Highlights

2019 was an eventful year with a large number of national and international events shared with numerous partners, illustrating GEVES's key position in the seed sector.



SIVAL 2019 Trade Fair - Angers

Conference:
Varieties and seeds: from heritage value to eco-friendly innovation. How GEVES participates through its missions in rethinking farming for tomorrow.

International PathoLED workshop on 14 May, Beaucauzé

GEVES organised a time of exchange and solution searching on LED technology and its impact on phytopathology in the context of the upcoming neon ban.



New CEO appointed

Following Arnaud Deltour's decision to retire, Alain Tridon was appointed the new CEO of GEVES in July.



16th Laboratory Open Days - 74 participants.

Programme included: workshop on metrology for seed testing, seminar on changes in ISTA rules, presentation of methodological developments for germination and tools for training, and a round table on the role of the laboratory manager.



UPOV BMT Meeting 2019 - 16-18 October 2019

GEVES participated in the UPOV Annual Meeting on the use of Biochemical and Molecular Techniques in DUS testing in Hangzhou, China.



IPM Trade Fair - 22-25 January - Essen - Germany
GREEN, GREAT, GORGEOUS!
GEVES shared a stand with the CPVO, Bundessortenamt, NIAB and Naktuinbouw at this trade fair dedicated to ornamental plants.



Culturales - 5-6 June - Poitiers

GEVES took part in this unmissable event for those involved in the field crop species sector!

With the theme "What varieties for tomorrow?", it was an opportunity to present the progress made in the evaluation of new varieties and variety data which is made available to all through the French catalogue.



32nd ISTA Congress



Hyderabad - India
GEVES contributed strongly at the ISTA Seed Congress which brought together more than 500 participants including ISTA members and participants from 25 Indian states.



Click on the article for more information!

4th Cereals Open Day

10 December, Beaucauzé

GEVES organised a seminar for cereal seed laboratories. The programme included an update on ISTA rules and workshops on the transcription of results and another workshop on temperature for germination tests.



Test year for the revision of maize VCUS testing

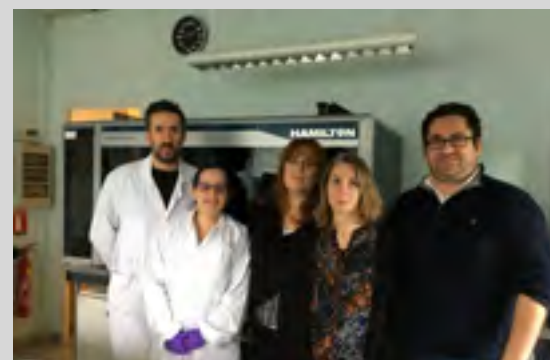
GEVES tested 2 major changes in the technical regulation for registering maize varieties:

- A national listing threshold defined from a zero point representative of the current market level to which an annual progress objective is added. A listing threshold was defined for each of the characteristics studied and adapted to each of the maturity groups.
- Use of additional data provided by the applicants to confirm the results of the CTPS network. The additional data is acquired at the same time as the official examination, and is checked and validated by the CTPS. This method of examination will make it possible to take a decision on variety listing at the end of the first year of the VCUS examination and offer users a faster distribution of genetic innovation.

More genotyping in maize DUS testing

The effectiveness of maize DUS testing is optimised through the use of SNP markers. This work is carried out by GEVES's genotyping unit and is used to reduce the number of pairs to be planted in the field in the second year, and to check the conformity of hybrid formulas and the identity of maintenance batches.

Furthermore, in 2019 GEVES proposed an evolution of UPOV Model 2 which was validated by UPOV and implemented. It allows the genetic distance to be used on its own if it is high enough to decide which pairs of varieties to compare in the field. Consequently, the number of plantings could be reduced by 80%.



Expansion of CPVO entrustment for ornamental plants

The GEVES Ornamental, Perfume and Medicinal Plants division has expanded its activities and demonstrated its high standards in keeping with CPVO requirements :

- Entrustment for the Chrysanthemum genus,
- Confirmation of entrustment for numerous genera acquired as a result of Brexit,
- Renewed entrustment for previously managed genera.

This success allows the scope of GEVES's ornamental expertise to be extended with CPVO entrustment for 290 species covering 79 genera, with an *in vivo* reference collection for a quarter of these i.e. around 3,500 varieties. In 2019, 240 ornamental DUS studies were carried out, and this number will rise to 320 in 2020.



EU INVITE project kicks off

The European INVITE project kicked off in July 2019, aiming to improve the efficiency of variety testing (DUS, VCUS) and the information available to users of varieties.



GEVES is involved in developing of new tools for variety genotyping and phenotyping, implementing statistical models and tools, and making these tools available to examination offices.

Prior to the project kick-off meeting, GEVES welcomed 120 participants at the Anjouère experimental station for demonstrations of field phenotyping tools (cameras for evaluating symptoms of fusarium head blight on wheat ears, portable systems for measuring the characteristics of maize ears, drones, connected insect traps).

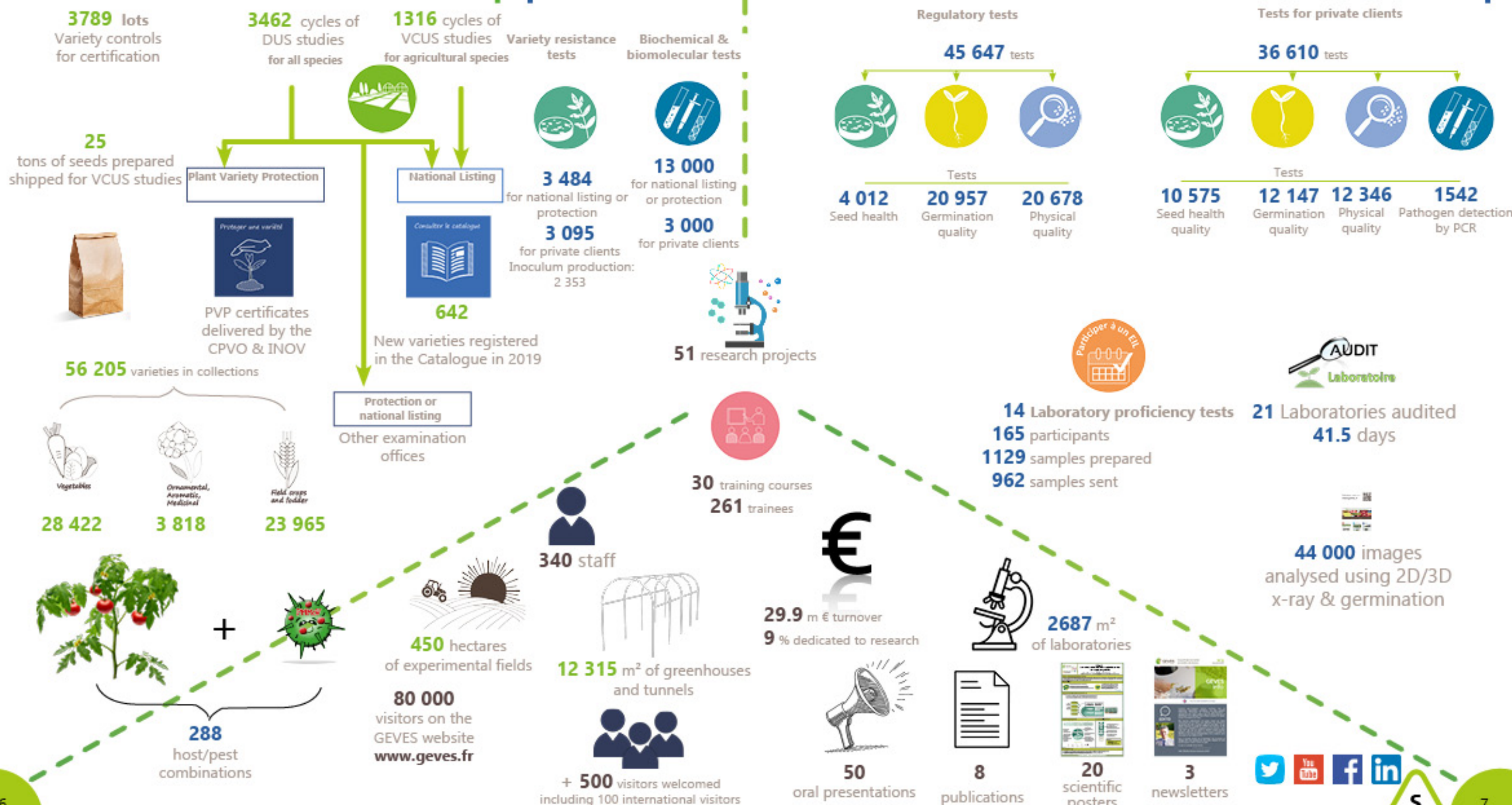
Variety testing

Key Figures in 2019

Seed quality testing

Field trials

Laboratory tests



Accompanying the agricultural & ecological transition

Promoting pest resistance in plant varieties

GEVES is involved in two action plans set up by the Ministry of Agriculture (SPAD and Ecophyto) to promote sustainable agriculture and reduce pesticide use. This is reflected in particular in the development of new resistance tests in variety testing: *Meloidogyne*/pepper, viruses/squash and yellows viruses-sugar beet with inoculation by viruliferous aphids.

In order to promote the reduction of use of plant protection products, the bonus/malus grid in the national listing regulation for durum wheat has been revised. A bonus has been introduced for varieties showing resistance to brown rust, Septoria and yellow rust.

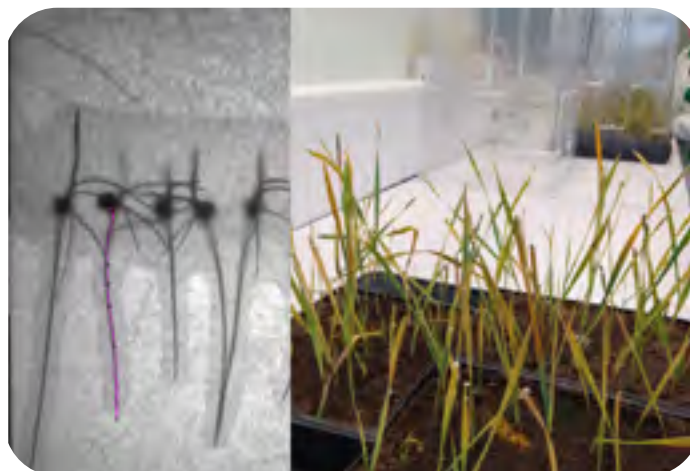


Of the 147 host/pest combinations worked on in the pathology laboratory under controlled conditions, activities are increasingly oriented towards intermediate resistances for sustainable management. In 2019 the CASDAR Pathostat-Veg project was completed, with the development of an open source application, available online at <https://www.geves.fr/tools/pathostat/>, for statistical analysis of intermediate resistance tests and harmonised interpretation between seed companies and examination offices.



Biocontrol and Biostimulation

Once again this year GEVES has contributed as a seed expert and public methodological research organisation to the development of biocontrol and biostimulation of seeds and seedlings. Among the work carried out, GEVES initiated and contributed to the organisation of a scientific workshop on Seeds and Biocontrol which met with great success in October 2019.



Fabien Masson
Head of the Variety
Study Department

"The variety description work carried out by GEVES and its partners as part of national listing testing is essential to identify varieties adapted to crop management practices that consume less plant protection products. With the variety action sheets from the CEPP (Certificates of Economy of Plant Protection Products) system, we are able to make a direct link between the level of variety resistance to pests or lodging and the potential reduction in plant protection products. GEVES contributes to this regulatory system by proposing new action sheets with technical institutes and participating in updating sheets within the CTPS expert commissions, in particular to take account of changes in variety behaviour. Currently, the CEPP sheets concern common wheat (diseases, lodging, midges), sugar beet (leaf diseases), potato (mildew) and rapeseed (TuYV virus). A barley sheet is in preparation."

Evaluation of plant varieties with ecosystemic services

Since 2014, the CTPS Inter-Sections Commission dedicated to the evaluation of Ecosystemic plants (CISPS), led by GEVES, has been evaluating varieties that can provide services to the crops of the rotation (intercrops, companion plants, etc.). In 2019 the CTPS validated the creation of the heading "Use as an Ecosystemic Plant" which was added to the technical regulations for the national listing of each species group. The examination of two new varieties has caused intense internal and external debates: a variety of early rape "meligethes trap", and an endophyte meadow fescue variety presented as a pest regulator. Collaboration has been initiated with the CEPP commission. The CISPS has worked to improve awareness of ecosystemic plants and the work of the CTPS, in particular at the 2019 Culturales trade fair.

Varieties for Organic Agriculture

The CTPS Commission dedicated to Organic Agriculture (CISAB) was set up in 2017 to encourage and facilitate the national listing of varieties for Organic Agriculture. This commission, which cuts across the CTPS sections, is developing an approach to be proposed for each species:

- Starting from the needs of users of varieties for organic production,
- Construct the evaluation process by checking characteristic by characteristic whether the evaluation requires organic conditions and introducing organic tests in all cases,
- Adapt the national listing rules to include the importance of the different organic characteristics.

In 2019, GEVES carried out the following actions: speaking at the 2nd meeting of the Organic Field Crops and the Tech and Bio Fair, research projects concerning organic agriculture (EcoVAB, Carie ABBLÉ, setting up the Potatobio project, follow-up of the Liveseed project), work with the CTPS commissions on the common wheat regulation for varieties intended for organic production and construction of an index to identify potato varieties suitable for organic production, sharing of experiences with other examination offices.

Effect of biocontrol solutions on lettuce and chickpea: two new projects (Actifol and Ascolup)

The GEVES pathology laboratory is involved in two major new CASDAR projects: ACTIFOL (*Fusarium*/Lettuce) and ASCOLUP (Anthracnose/Lupin, Chickpea). These projects focus on the development of seed detection tests and evaluation of varietal resistance. One component focuses on searching for alternative solutions and techniques for physical treatment with development of the pathosystem and evaluation of efficacy in comparison with a chemical reference. The objective is to find treatment or disinfection solutions as an alternative to chemical treatments in line with the objectives of the Ecophyto plan (action plan launched by the French Ministry of Agriculture to promote sustainable agriculture and reduce pesticide use).



Video : pepper variety resistance
www.youtube.com/user/GevesVideos/videos

Virus Research Projects

In order to protect plants against aphid-borne viruses and thus avoid the use of insecticides, research programs are underway to:

- Better understand the epidemiology of the different virus strains,
- Optimise protocols for evaluating variety resistance/tolerance to viruses
- And thus promote breeding of resistant varieties.

In particular, GEVES is contributing to the CASDAR ExtraPol project, concerning beet yellows viruses and the FSOV JNOrge project, for sustainable management of the barley yellow dwarf virus.



Valérie Grimault,
Head of the PhytoPathology
Laboratory

"The new Plant Health Regulations have transferred certain quarantine pests to the category Regulated Non-Quarantine Pests (RNQP). Together with ANSES (the French Agency for Food, Environmental and Occupational Health & Safety), we have considered transferring to GEVES the NRL mandate for RNQP whose predominant matrix is seed. This concerns 70 host/pest combinations, with the validation of associated methods and technical supervision of the network of approved laboratories to be rolled out in 2020."



Plant Genetic Resources (PGR)

Official recognition of 3 collection managers

The first three favourable opinions for official recognition as "Managers of Plant Genetic Resources Collection(s)" for Food and Agriculture were issued by the CTPS Plant Genetic Resources Section. They concern individual structures: the Conservatoire Végétal Régional d'Aquitaine (CVRA) for fruit species and Mrs Loubert for a rose collection, and a structure on behalf of a network of managers: the Conservatoire des Collections Végétales Spécialisées (CCVS) associated with the Shamrock hydrangea collection. New applications will be evaluated in 2020.



Rose collection, Mme Loubert



Apple diversity (CVRA collection)

Building a National Collection

Decision trees have been drawn up to identify the plant genetic resources for agriculture and food (Art. L.660-2 of the French Rural and Maritime Fishing Code) whose heritage (Art. L. 660-3 of the French Rural and Maritime Fishing Code) can be included in the national collection. Following approval of the technical regulations by decree of 19 July 2019, the first contributions are expected in 2020.

Participation in public-private cooperation networks for plant genetic resources

GEVES has been involved in public-private cooperation networks since the 1990s, set up at the time under the impetus of the Bureau of Genetic Resources (BRG), as a member or facilitator.

GEVES Network coordinator:

- Chicory

This network, created in 1996, contains a collection of 1600 accessions considered to be the world's first collection in terms of diversity. GEVES Brion is in charge of coordinating this network. Each year regenerations (between 15 and 35 accessions) are carried out by the partners whose number is decreasing due to company mergers and acquisitions. The list of the national collection defined by the network is available on request.

- *Cynara* (artichoke and cardoon)

This network was created in 1998 at the instigation of the BRG. GEVES Cavaillon is in charge of coordinating the network, maintaining the national collection *Cynara* consisting of 25 accessions, managing associated information (passport and characterisation data), and identifying accessions to be regenerated and the provision of these resources. Accessions are also preserved *in vivo* by the network partners.

GEVES Member of networks:

- Fruit Solanaceae

At Cavaillon, GEVES carries out annual characterisation trials (observation, measurements, photos, etc.) on aubergine plant genetic resources as part of the activities of the Solanaceae fruit network. It is also involved in the coordination unit of this network.

- Carrot

In Brion, GEVES hosts the annual characterisation and verification test of regenerations from the "Carrot and other *Daucus*" public-private cooperation network.

Setting up cooperation networks for Bean & Onion orphan species and *Lactuca*

The work carried out on these so-called orphan species, as they have no regenerated and characterised well-known collection, has identified stakeholders interested in becoming involved in safeguarding bean and onion plant genetic resources. In order to pool the cost of regeneration and restart the characterisation of these resources, public-private cooperation networks are being set up with about ten partners for beans and about fifteen for onions. One of their missions will be to define the resources to be included in the national collection.

GEVES is also supporting INRAE in the creation of a public-private cooperation network bringing together six actors for the *Lactuca* collection, which should be launched in 2020.



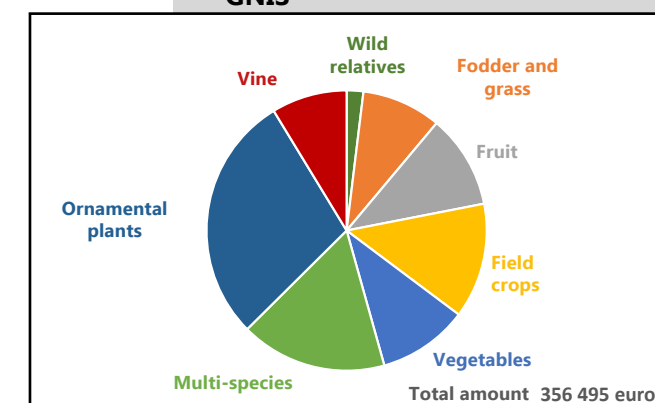
Bean diversity
Photo: Charles-Henry Duval

Call for applications in support of PGR collections and *in situ* resources

16 projects were funded in the joint call for applications with a support fund from the Ministry of Agriculture (MAA) and GNIS. The funding, amounting to €329,595 (€170,545 from the MAA and €159,050 from GNIS), was allocated to the improvement of conservation conditions and the characterisation of the resources conserved.

Four other projects were supported for actions to safeguard endangered collections and orphan species for the amount of €329,595 (€170,545 from the MAA and €159,050 from GNIS): €26,900 (€15,325 from the MAA, €11,575 from GNIS).

Breakdown of projects funded under the joint call for applications to the MAA and GNIS



Audrey Didier,
National Coordinator of Plant
Genetic Resources Conservation

"The action of national coordination is carried out for and with all actors involved in the conservation, characterisation and development of plant genetic resources (PGR) in France. We rely on a network of partners, creating a community where people know and recognise each other. Such as for example the participation of collection managers from Western France in the organisation of the second meeting of stakeholders which will take place in Angers in October 2020. On a larger scale, I am taking this French dynamic and diversity to international level, in particular through my participation in the steering committee of the European Cooperative Programme on PGR (ECPGR) and by following developments in the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA)."

Contributing to evolving regulations



New national listing procedures for fruit heritage varieties

The national listing of fruit varieties on List 2 of the French Official Catalogue based on an Officially Recognised Description by the CTPS is now in place. It is possible for all varieties which have been marketed before 30 September 2012, and testing costs are covered by the Ministry of Agriculture.

Several sectors have seized this opportunity to enhance their heritage, or even to organise a certification system for fruit material. After 7 heritage olive tree varieties registered in late 2018, 23 files (11 raspberry and 22 citrus fruit trees) were accepted in 2019 and will lead to national listing in 2020. The chestnut and olive tree sectors are also preparing numerous applications.



Organic heterogeneous material

The new European Organic Farming Regulation 2018/848 authorises, as of 1 January 2021, the marketing of a new type of plant material: organic heterogeneous material.

It is characterised by a high genetic and phenotypic diversity, so high that it cannot be considered as a variety. If the Regulation indicates that this material is just subject to notification, delegated acts providing for rules governing production and marketing are to be published in 2020 by the European Commission.

CISAB (the CTPS commission dedicated to Organic Agriculture) and the group that monitored the European temporary experiment on varieties of common wheat population in France (an organic seed cooperative, ITAB, SOC (the official French Service for Control and Certification of Seeds) and GEVES) have worked on proposals for these acts, which have been sent to the Ministry of Agriculture.

What's new for studied and registered varieties ?

Varieties with innovative characteristics are regularly presented to the CTPS, and GEVES sets up appropriate experiments with its partners to evaluate them.

In 2019, sugar beet varieties claiming tolerance to yellows virus (a reappearing disease due to the disappearance of certain seed treatments) were studied in a special trial.

For protein crops, a coral-coloured pea for use in pea processing and a «marrowfat» type pea are currently being studied and will complete the range of varieties intended for human consumption. In addition, new national listings of protein peas have shown progress in terms of tolerance to Aphanomyces, measured in a network of contaminated plots.

For potato, one variety was registered with a very high environmental score (=7), while most current varieties have a score of 0. This score (on a scale of -2 to 8) is an indicator combining resistance to leaf and tuber blight as well as cyst nematodes and is related to potential savings in fungicide and nematicide treatments.

For oilseed rape, applications for varieties which are too early for the mainstream oilseed rape market but can be used as a companion plant to trap meligethes are being examined.

Innovation in plant breeding is also reflected in proposals for varieties of new species: for example, for the first time GEVES is going to study a variety of plantain as a fodder plant, and safflower and Chinese radish for use as a service plant.

New uses are emerging: energy crops (for methanisation) are being studied, as are varieties adapted to overseas territories, and sorghum varieties providing white flour.

These various examples illustrate the capacity of national listing regulations and experimental schemes to support the evaluation of innovative varieties.



National listing systems in constant evolution

In order to adapt and stay as close as possible to the needs of the various plant sectors and in line with public policy guidelines, the variety evaluation systems are regularly adapted.

In 2019, the new common wheat VCUS system will be extended to 3 testing networks to better take into account the diversity of production situations.

For durum wheat, the quality classes have been revised to offer greater clarity and be more in line with the different market segments.

For rapeseed, thanks to the partnership with Terres Inovia, the system has been enhanced by the evaluation of characteristics that were previously only evaluated post-listing (TuYV, autumn elongation, broomrape).

The new rules for sunflower listing have been simplified to focus on regaining productivity while maximising the informational capacity of the network, particularly in terms of disease resistance and tolerance.

Finally, the listing of sugar beet varieties showing "very good resistance" to cercosporiosis will be facilitated by the granting of a super bonus.



Virginie Bertoux,
Secretary General of the CTPS

"Each year, more than 2,500 new varieties are studied by GEVES. The CTPS, a consultative committee gathering a range of representatives (scientists, administrative representatives, seed sector representatives) discusses the results provided by GEVES in view of their national listing. In recent years, we have observed a greater diversity of uses and morphologies. New varieties often show better behaviour against pests (fungi, viruses, parasitic plants, nematodes, etc.), making it possible to reduce the quantity of pesticides required for their production (savings in phytosanitary treatment products quantified via CEPP standardised action sheets), or helping to make agricultural production safer in circumstances where only variety resistance or tolerance to pathogens and good agronomic practices work. There is also a return to the market of old heritage varieties, contributing to the preservation of these genetic resources through widespread marketing and an increase in cultivated biodiversity".

Enhancing knowledge on seed and variety testing

First year of using results from the "Amédiluze" project on alfalfa

Following the Amédiluze project financed by the Ministry of Agriculture, candidate alfalfa varieties are now compared "in silico" to varieties in the reference collection as soon as the application is submitted, thanks to information provided by breeders for 5 characteristics:

- Flower colour
- Dormancy
- Resistance to *Colletotrichum trifoli*
- Resistance to *Ditylenchus dipsaci*
- Resistance to *Verticillium albo-atrum*

After a full study cycle in 2019, the results are encouraging. In addition to reducing testing facilities (23% in the main DUS nursery and 77% in the flower colour trial), the system helps to better match candidates to potentially similar varieties, thus improving the accuracy of comparisons, leading to a reduction in the duration of studies (less postponement) and an increase in the DUS acceptance rate.

Another component of Amédiluze concerning the use of molecular biology has shown encouraging results, with a possible reduction in the number of field plantings and improved precision of comparisons.



9%
of budget dedicated
to research

51
ongoing research
projects

10
new research
projects in 2019



CASDAR project videos
<https://www.youtube.com/user/GevesVideos>

Development of a Broomrape resistance test for the evaluation of hemp varieties

In the framework of the CASDAR Seeds and Plant Breeding projects, GEVES has piloted a project providing methodological support to the Flax and Hemp CTPS Section for the development of a tolerance test for hemp broomrape under controlled conditions. This project was conducted in partnership with Terres Inovia, the LBPV (Laboratory of Plant Biology and Pathology) of the University of Nantes and Hemp'it. The various actions carried out made it possible to develop a standardised bio-test. This bio-test will be proposed as a complementary test to the VCUS studies of new hemp varieties. It will be carried out by GEVES (SNES).

AKER: a high-throughput year for sugar beet



In 2019, GEVES phenotyped nearly 3,000 sugar beet genotypes for their internal morphology and germination characteristics at 5°C and more than a hundred of the most extreme genotypes were closely analysed using 3D X-ray tomography, germination at 10 and 20°C and growth at 10°C. The data has been integrated into the URGi database, a data paper has been written on the pilot population used to develop the methods, and a chapter on phenotyping in the laboratory has been written in a book about the project. The summary of all this data will be produced in 2020.

Alternative Seeds for wheat and maize

After six years of dynamic and exciting collaboration between 12 private-public partners, new ground has been broken in the search for alternative solutions to phytosanitary seed treatments to secure good seed implantation of wheat and maize crops in a context of agro-ecological transition. Out of 90 biological solutions tested in the laboratory and/or in the field, 10 solutions have proven their value either as protectants, repellents or biostimulants. These candidate solutions will require an adapted formulation before being evaluated in the field in the post-project phase. GEVES has contributed to the consortium by developing devices for laboratory evaluation of the protective effect or stimulation potential of the solutions.



Harmores 3: 6 new variety resistance protocols adopted by the CPVO for tomato, melon and pea

This project, focusing on intermediate resistances, was funded by the CPVO and piloted by GEVES in collaboration with 7 other examination offices, 9 seed companies, the CTIFL and the CPPSI. It aimed to harmonise 6 protocols for evaluating the pest resistance of vegetable varieties in DUS (Distinctness - Uniformity - Stability) studies for plant variety protection and national listing.

The new harmonised protocols for the host/pest combinations studied (tomato/*Meloidogyne incognita* and *Fusarium oxysporum* f. sp. *lycopersici*, melon/*Podosphaera xanthii* and *Fusarium oxysporum* f. sp. *melonis*, pea/*Erysiphe pisi*) have been accepted by the CPVO and will soon be officially published.



Aurélia Gouleau,
Head of Scientific Coordination

"At GEVES, we conduct research aimed at improving and developing new tools and methods for seed and variety testing in the context of climate change, agro-ecological transition and crop diversification. To do so, we rely on our expertise in pathology, phenotyping, molecular biology and data processing. In 2019, 51 research projects were underway at GEVES, including internal research projects as well as national and international collaborative projects in partnership with research organisations, technical institutes, seed industry professionals and other examination offices."

An epidemiological monitoring platform in Europe for cereal rusts

The European H2020 Rustwatch project aims to develop an epidemio-surveillance system for the early monitoring of rust in cereals, based on a multi-network approach and sharing of communication infrastructures to ensure better control of rust strains in Europe. For the past three years, GEVES has been managing the European VCU network to collect information on yellow, brown and black rust pressures in Europe and to identify early yellow rust strains and new virulences. This involves carrying out field symptom scoring on a common differential host kit at 80-100 VCUS sites in 17 countries, and the races are identified by INRAE or the University of Aarhus. In 2019, GEVES participated in the development of a Wheat Rust Toolbox database in coordination with the University of Aarhus to produce epidemiological maps of rust pressure and races found in Europe.



Find out more:

<https://www.geves.fr/news/an-epidemiological-monitoring-platform-in-europe-for-cereal-rusts/>

Seed reference collections to identify species, varieties and pests

The physical quality of seed lots intended for planting is assessed in particular by examining the presence of seeds of other plants in the lots. To do this, GEVES experts have a large seed collection of more than 17,000 different species of dry seeds. This collection will be enriched in 2019 with 400 new samples. The botanist at the physical analysis laboratory has carried out an inventory of the technical collection of 500 species. This collection is used to carry out certain laboratory activities: training, laboratory proficiency tests, and providing specific collections for company laboratories. In 2019, 24 specific collections were prepared and shipped, including 13 internationally.

For variety resistance testing to pests, seed health testing and treatment efficacy testing, the pathology laboratory maintains a collection of 2,750 pest isolates, including 250 reference isolates. Seed collections of variety resistance reference controls and differential host sets have been completed and validated in research projects such as for the three new pathosystems *Meloidogyne*/pepper, virus/squash and beet yellows viruses/sugar beet, and following the conclusions of the CPVO Harmores 3 project.

For DUS (Distinctness, Uniformity, Stability) studies conducted for national listing of varieties in the Official Catalogue or for granting intellectual property titles (Plant Variety Rights), GEVES experts compare, in the field or in the greenhouse, candidate varieties with varieties of common knowledge. For this purpose, GEVES keeps reference collections of 56,205 varieties in the form of cold room seeds or *in vivo* plants (at GEVES's Magneraud, Brion, Cavaillon-Carpentras and Anjouère units), including 23,965 agricultural, 28,422 vegetable and 3,818 ornamental varieties.



17000
samples of dry seeds
of different
species

2750 pest isolates

56 205
living varieties
conserved

PeaMUST: new technology provides high-performance tools for the characterisation of insect damage on peas and field beans

For this project, the Physical Analysis laboratory was in charge of phenotyping pea and faba bean collections using X-ray tomography to characterise insect damage on seeds. With the development of acquisition parameters as well as image processing developed in-house, it was possible to carry out precise, automatic and high throughput (30 seeds/minute) evaluations of damage caused by bruchids. In 2019, the last collection of the project was phenotyped. In total, over the entire project, nearly 3,500 genotypes and more than 600,000 seeds were analysed by tomography. A publication in a scientific journal is being prepared.



Results of the CASDAR Carie ABBLE project on common wheat

The Carie ABBLE project has resulted in:

- better knowledge of the variability of common bunt species and races in France, by demonstrating the predominance of *T. caries* and the virulence of Bt7, Bt2 and Bt15;
- the development of a resistance test for common bunt in the laboratory, at the 2-3 leaf stage (8 weeks), earlier than the field test at the adult stage (8-9 months), while avoiding the spread of bunt spores in the field.

A test for resistance to common bunt with respect to predominant virulences will be used for the listing of common wheat varieties registered in the French Catalogue for use in organic production. GEVES will also be able to offer its services to breeders to evaluate varieties registered for conventional agriculture.



Valérie Cadot
Pest Research Manager

"At GEVES, we carry out methodological and research work with national and international partners to:

- develop and improve methods for assessing pest resistance of varieties for national listing,
- participate in updating knowledge on strains and races, as well as circumvention of resistance.

The H2020 Rustwatch project and the national CASDAR Carie ABBLE project illustrate these two themes, ultimately aiming to reduce the use of plant protection products.

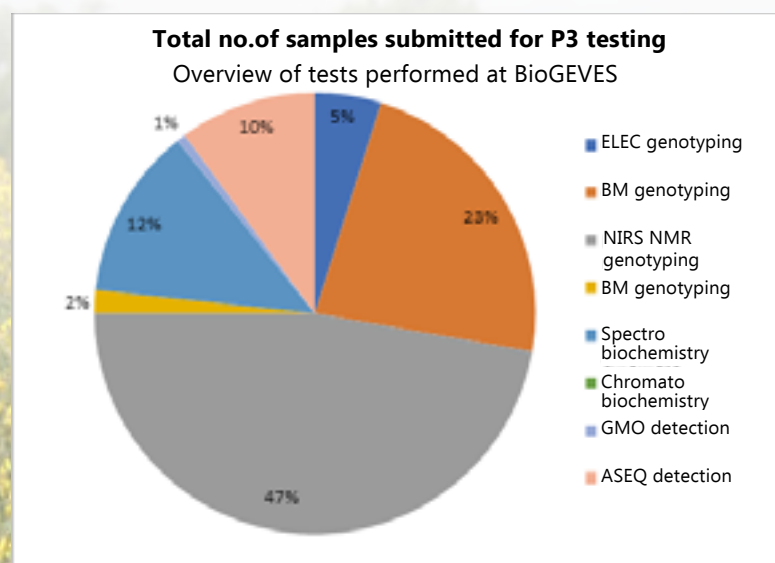
I participate in coordinating VCUS studies on variety resistance, with 41 resistance tests specific to pests in the field and 27 laboratory tests available. Other evaluations are carried out in natural contamination in "yield" trials and depend on the pest/disease pressure that year.

My overall vision for groups of field crop species also helps the CTPS to propose rules that encourage the national listing of resistant varieties, for example by granting bonuses to resistant varieties."

Developing use of new technology and digital tools

NIRS used in official CTPS rapeseed studies

GEVES has conducted an internal study to develop a technique for analysing the composition of rapeseed using near-infrared spectroscopy (NIRS). NIRS is an indirect, rapid, non-destructive method that does not require the use of chemicals and has recognised potential in the field of agri-food and breeding. In this study, GEVES explored different modelling approaches and proposed models for predicting glucosinolate, protein and oil content. The CTPS rapeseed section validated the change of analytical methods using NIRS with implementation from 2018 for the determination of glucosinolates and from 2019-2020 for the determination of protein and oil. These official NIRS tests will be performed in addition to tests which are already routinely applied, in particular for protein content predictions (soybean, durum wheat, pea, field bean) and oat kernel fineness.



I.D.SEED® database goes international

As part of its National Reference Laboratory (NRL) mission, the physical analysis laboratory provides technical support to company laboratories by offering adapted tools and reference materials. The I.D.SEED® seed identification database provides training and technical support to laboratory analysts. I.D.SEED® currently references 791 species. Among these species, priority has been given to the species that are most frequently encountered in tests. In 2019, the I.D.SEED® database was fully translated into English with the aim of disseminating and promoting GEVES expertise internationally. To date, I.D.SEED® has 277 subscribers, 30 of whom are English-speaking.

New e-learning platform

GEVES, as part of its NRL mandate, provides technical support to accredited and approved laboratories, including training for analysts. E-learning provides trainees of a variety of profiles with the opportunity to discover material before training sessions, and to access learning resources and activities. The "Basics for Seed Analysts" certification training was chosen to launch this exploratory e-learning project at GEVES. Over 2 sessions, 23 trainees tested this new tool and were won over, as were the participants in the laboratory open days who also discovered this platform.

"Are you a top SEED?": a new game created by GEVES

GEVES created an all-new game based around photos of seeds from the I.D.SEED tool. I.D.SEED was developed by the physical analysis laboratory of the GEVES National Seed Testing Station and contains more than 1000 photos with descriptive sheets, primarily for use by seed professionals. This game will be gradually expanded to include the many species already available in I.D.SEED. Whether expert or novice, adult or younger, you can explore the diversity of seed shapes and sizes and find out more about plant species. The Pays de la Loire Region provided financial support for the creation of this digital game, highlighting its pedagogical and scientific qualities.



Interactive seed recognition game



Aurélie Charrier,
Head of the Physical Analysis
Laboratory

"Innovation is key to developing physical seed quality testing. At present, testing is carried out manually and visually and relies solely on the expertise of our analysts. Recent developments in artificial intelligence have opened up interesting new perspectives. In the physical analysis laboratory, we are working on integrating these new technologies in an aim to partially automatise our testing activities."



Our training courses:
<https://www.geves.fr/training-at-geves/>

I.D.SEED®

791
species
in I.D. SEED

277
subscribers
incl. **30**
for the
English version

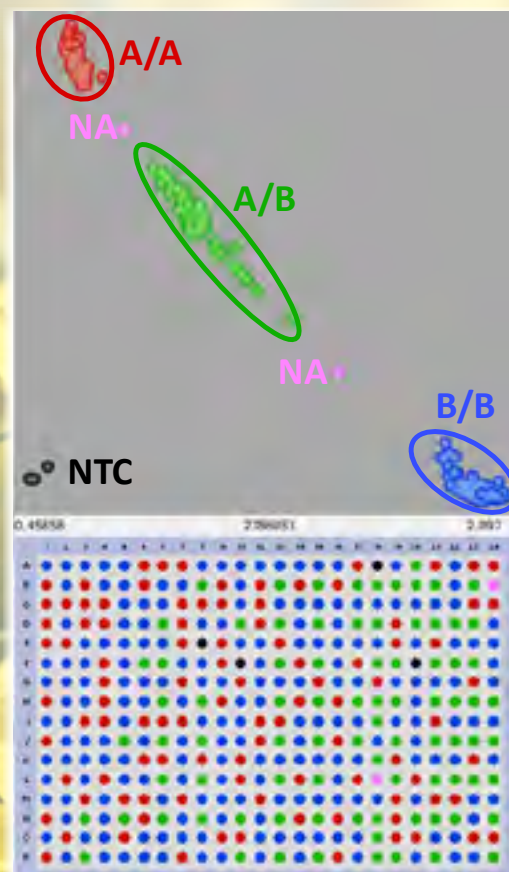
<https://mediatheque.geves.fr/geves/identification>

Launch of SNP rapeseed project

The increasing size of the reference collection for winter oilseed rape and the importance of environmental effects on variety phenotyping means that a large number of DUS trials are carried out each year.

In collaboration with BSA (German testing office), and NIAB (UK testing office), this CPVO-funded European level project aims at selecting a set of SNP markers and testing models allowing the use of genetic and morphological data to reduce field planting from the first year.

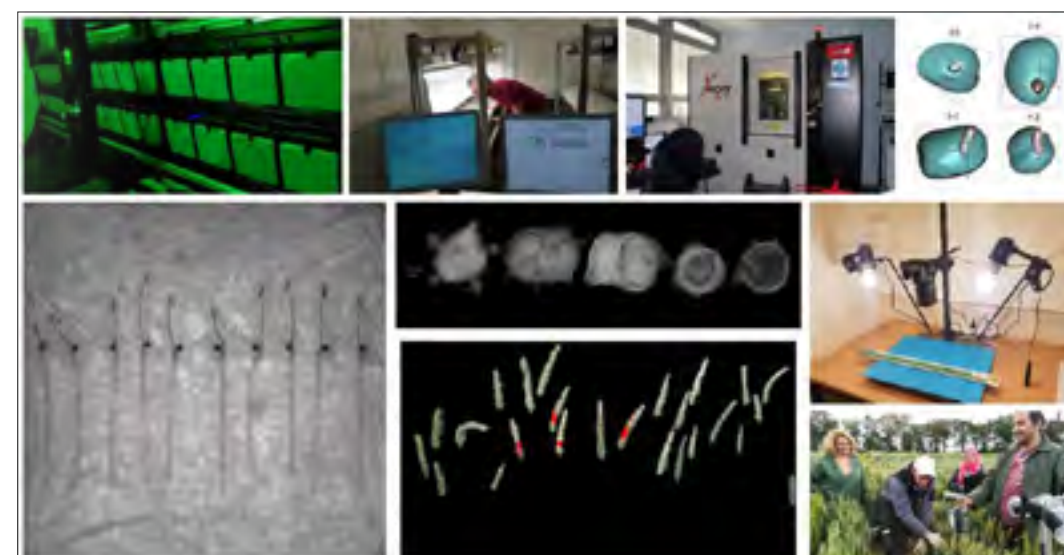
The project started in June 2019. A collection of 2000 common varieties has been created by France and Germany, and genotyping work has begun. Phenotypic data has been collected and discussions on the models have begun.



Phenotyping of fusarium symptoms

As part of the CASDAR IRIGAM and FSOV Fus'eye projects, chemometric analyses of hyperspectral images (400nm-1000nm) have been used in the laboratory to identify wavelengths that reveal symptoms of fusarium head blight for common wheat, durum wheat and triticale.

Comparisons between different multi and hyperspectral sensors are continuing in the field using artificial intelligence techniques to develop a phenotyping tool based on VIS-NIR multispectral imaging for precise and specific testing of varietal resistance to Fusarium head blight, using a hands-free kit in the field.



Phenotyping at GEVES

QUALILEV Project

The QUALILEV project began in 2019, and aims to improve the germination quality and emergence speed of sunflower seeds under unfavourable conditions.

The project brings together 4 partners including GEVES and is supported by the FRSO (Support Fund for Oilseed Research) for 3 years.

The first trials on 60 hybrids of the 2 breeder partners of the project showed good tolerance to cold but different growth dynamics when exposed to both hydric and thermal stress. The second year of the project will extend phenotyping to the parent lines of these hybrids and to a second batch of these same hybrids and lines produced under the same conditions during the first year of the project. More than 200 genotypes will be analysed at GEVES, with a view to extending automation of growth monitoring using the phenotyping platform to this new species.

Molecular marking (SNP) to support Maize DUS

Genetic Distance/ Morphological Distance Combination (UPOV Model 2)

Since 2013: DG / DM threshold > 80% reduction in planting

2019: validation of a second DG / DM threshold > additional reduction of 15-20%

4953 pairs to put in the field

Threshold DG/DM n°1

787 pairs to put in the field

(4166 pairs that do not need field comparison)

Threshold DG/DM n°2

555 pairs to put in the field

(234 pairs that do not need field comparison)



Didier Demilly,
Phenotyping Coordinator
Vision and Image Analysis
Engineer

"Digital phenotyping, which characterises seeds, seedlings or plants using imaging or sensors, is a strong focus for GEVES. The PHENOTIC platform, developed with the IRHS, was recently awarded the IBISA label. The AKER and PeaMust projects have increased our seed phenotyping activities, allowing us to carry out more high throughput tests. Several other ongoing projects (INVITE, FusEye, Qualilev, Eucleg, Literal with UMT Capte...) have allowed us to continue developing our capacity to perform high-throughput testing".

Guaranteeing high-quality seeds and seedlings

GEVES, National Reference Laboratory (NRL)

In 2019, a review of the organisation of training and support for trainers was carried out. At the same time, e-training modules have been set up and proposed for the *Seed Analyst Basics* training course. A revision of the recognition audit process has led to a reduction in the total duration of recognition audits. The IT tool dedicated to laboratory proficiency tests (PT) is undergoing major improvements. Activities related to formalising test methods, by integrating methods from the certification part of technical regulations annexed to seed production, have strongly increased.



VIGERM: aiming for a rapid assessment of seed germination and vigour



The VIGERM project is funded by ISTA for a period of two years and aims to develop rapid tests to assess seed germination and vigour for 5 Brassicaceae species (cauliflower, cabbage, radish, mustard and Chinese cabbage). It is part of a collaboration between the ISTA Germination, Vigour and Technologies committees.

For the first 6 months of the project, GEVES hosted Takashi Shinohara, a professor-researcher from the Tokyo University of Agriculture at the GEVES germination laboratory where he carried out laboratory and field tests. Imaging methods will also be explored.

160

species covered by the NRL mandate to assess physical, germination and health quality.

22

courses and 274 training days including 4 training sessions for Analyst and Senior Analyst certificates.

70

methods currently being prepared for formalisation.

21

audits including 19 recognition audits for the SOC

14

Proficiency tests organised, including 4 for the SOC (official French service for control and certification of seeds), with 169 participants, 962 samples sent and 1,129 samples prepared.

+

74 Participants - Lab Open Days

13 Participants - Cereals Day

Seed testing expertise

In 2019, the high level of skills and expertise of GEVES's laboratory staff was once again widely recognised by the auditors of various recognition bodies: ISTA (renewal of accreditation), COFRAC (maintenance of accreditation and validation of conformity to the requirements of ISO 17025 version 2017). This expertise enables GEVES to guarantee the reliability of its work for the seed industry. ISTA accreditation for batch sampling ensures traceability between the batch and the test. At the same time, it enables GEVES and other French laboratories to issue international certificates, which are essential for seed exports.

Development of a detection method for the tomato virus ToBRFV

The Pathology and BioGEVES laboratories worked together on method development and validation to prepare for the new quarantine status of this emerging tomato virus. A range of detection methods for ToBRFV on tomato and pepper seed are now available at GEVES including Indexing, ELISA, and SE-PCR with an RT-qPCR test developed and validated at ISHI-Veg. In addition, work on seedlings has confirmed the ability of ToBRFV to bypass the Tm2² resistance gene.



Thibaut Decourcelle,
Head of Development of National
Reference Laboratory (NRL) Activities

"The GEVES NRL for Seeds and Seedlings has unique technical expertise with regards to research and international seed organisations. It has a central role with the SOC (official French service for control and certification of seeds), seed companies and the Ministry of Agriculture.

Our NRL status is a technical guarantee for certification."

National and international cooperation

Cooperation activities with the IP Key Project (Intellectual Property)



IP Key is a project funded by the European Union and EUIPO (the EU Intellectual Property Office) for countries that have signed free trade agreements with the EU. The project aims to support these countries in setting up intellectual property protection systems. Together with the CPVO and UPOV, GEVES is involved in the plant variety protection component by participating in the training of agents in DUS testing. In 2019, delegations from South-East Asia and China visited GEVES, and 3 Chinese colleagues were trained in maize DUS for two weeks at the GEVES station in Le Magneraud. Further actions are planned in 2020.

European VCUS Group

VCUS experts from 17 examination offices met at Naktuinbouw (Netherlands examination office) with representatives from the CPVO and DG Health and Food Safety (European Commission).

After an overview of news on the VCUS systems in each country, a major part of the seminar was spent reviewing methods for evaluating and registering varieties for use in organic farming.

GEVES presented the activities of CISAB, the CTPS commission in charge of developing variety testing for organic farming. The group worked on a memorandum which was sent to the European Commission, explaining the need to develop a VCUS testing system adapted to the needs of both conventional and organic agriculture.

Active member of ISHI and ISF

GEVES participates in 4 ISHI-Veg groups and chairs 2 groups. The validation of identification of *Xanthomonas* in beans was coordinated by GEVES and the method was published by ISF.

At the IBEB, GEVES participated in naming a new race of *Bremia* and in a workshop for harmonising the interpretation of test results on new genetic resistance constructs.

GEVES chairs the ISF DRT (Disease Resistance Terminology) group, and coordinates or participates in 3 interlaboratory projects for the validation of differential host sets and reference isolates (*Oidium*/melon, *Fusarium*/lettuce, leaf mould/tomato).

GEVES-CTPS collaboration

GEVES provides 13 of the 15 technical coordinators in the CTPS sections, runs 2 inter-section commissions (CISPS, dedicated to the study of ecosystemic plants, and CISAB, set up to promote the listing of varieties adapted to organic agriculture), and provides the general secretariat of the CTPS.

On a daily basis, GEVES carries out a large number of DUS examinations on more than 145 species, either on its own or working with partners, and coordinates the implementation of more than 1,900 VCUS tests all over France. Nearly 45 GEVES agents lead the work of the CTPS expert commissions, which bring together more than 300 experts in meetings or in the field. These commissions use their expertise to help develop technical examination protocols to guide the varieties registered to support the agro-ecological transition.

A prominent player within ISTA

18 GEVES staff contributed to the governance and work of ISTA in 2019, some as members of the ECOM (Executive Committee) or as chairs or members of technical committees and working groups.

In total, GEVES helped to validate 6 germination, vigour and pathogen detection methods, to organise and/or supervise 6 proficiency tests, to conduct 11 audits and to organise a seminar.

GEVES led the updating of the ISTA Blue Book which, together with a bibliographical review and a network of international experts, resulted in the publication of the ISTA Reference Pest List for 10 field crop species.



Collaboration with the CPVO and UPOV

In 2019, GEVES participated in various UPOV Technical Working Parties (TWA for Agricultural Crops, TWF for Fruit Species, TWV for Vegetable Species, TWC for Harmonisation of Software and Statistical Methods, BMT for Harmonisation of the Use of Molecular Biology Tools).

These Working Parties are responsible for the preparation and development of technical documents interpreting the UPOV Convention, with a view to harmonising DUS testing in the Member Parties of the Convention. GEVES brings to these working groups its technical, statistical and computer development expertise. In 2019, GEVES experts led the revisions of the Technical Guides for DUS testing for berberis, hydrangea, lagerstroemia, sweet cherry, pear, chickpea, melon, squash and turnip.

GEVES also participates in the meetings of the Technical Committee and the Council of UPOV.

At European level, GEVES, as an Examination Office, actively participates in the various working groups organised by the CPVO. GEVES contributes to the drafting of protocols, the consolidation of operating rules and reflections on future developments.



In 2019, GEVES experts had the opportunity to present the progress of the SNP Oilseed Rape project and the results of the Amediluze project, as well as the first version of a DUS Alfalfa protocol resulting from the project.

GEVES shares its expertise in Africa



The African Intellectual Property Organization (OAPI), which covers the territory of its 17 founding member States (mainly French-speaking sub-Saharan African countries), joined UPOV in July 2014.

In order to concretely develop the granting of plant variety rights covering this vast territory, OAPI has designed and implemented a development program supported by the EU.

GEVES is contributing to this by providing on-site expertise to the establishments identified for testing new plant varieties, and by participating in awareness-raising and training activities for local stakeholders.

Further DUS training is scheduled at GEVES's experimental stations.

PathoLED: a workshop and a data-sharing tool

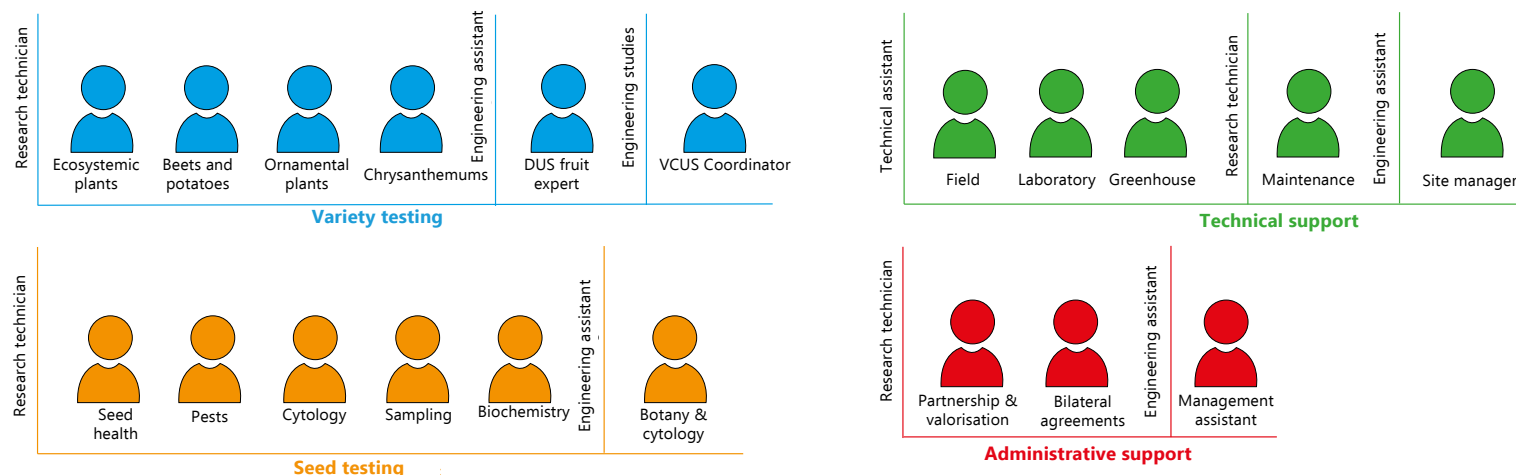
Changing light sources for resistance tests in climate chambers and opting for LEDs will of course have consequences on plant-pathogen interactions. On 14 May 2019 GEVES organised a workshop to discuss this issue with 97 participants from 6 European countries. Eleven speakers shared their experiences with multiple pathosystems. Round tables discussed the choice of LED material and its impact on technical parameters, human health and the environment. LED technology providers also presented their products.



Our staff

Recruitment in 2019

In 2019 GEVES has recruited to renew and maintain its skills but also to support the development of its activities.



Words from our staff

Source: MEDERIC HUMANIS Barometer for Health and Safety at Work: survey conducted by Sociovision, October 2019. Staff participation rate (temporary and permanent contracts): 51 %

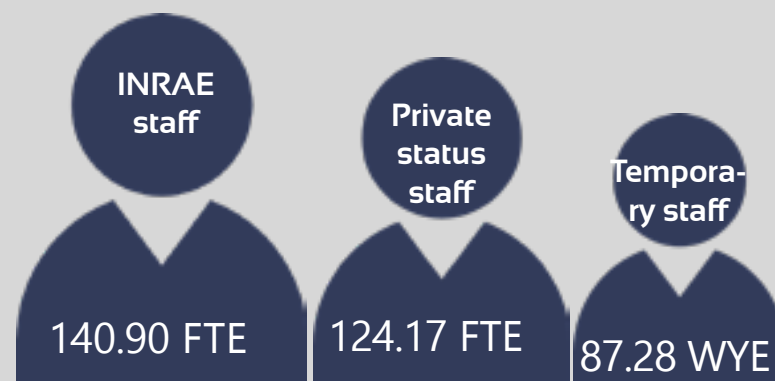
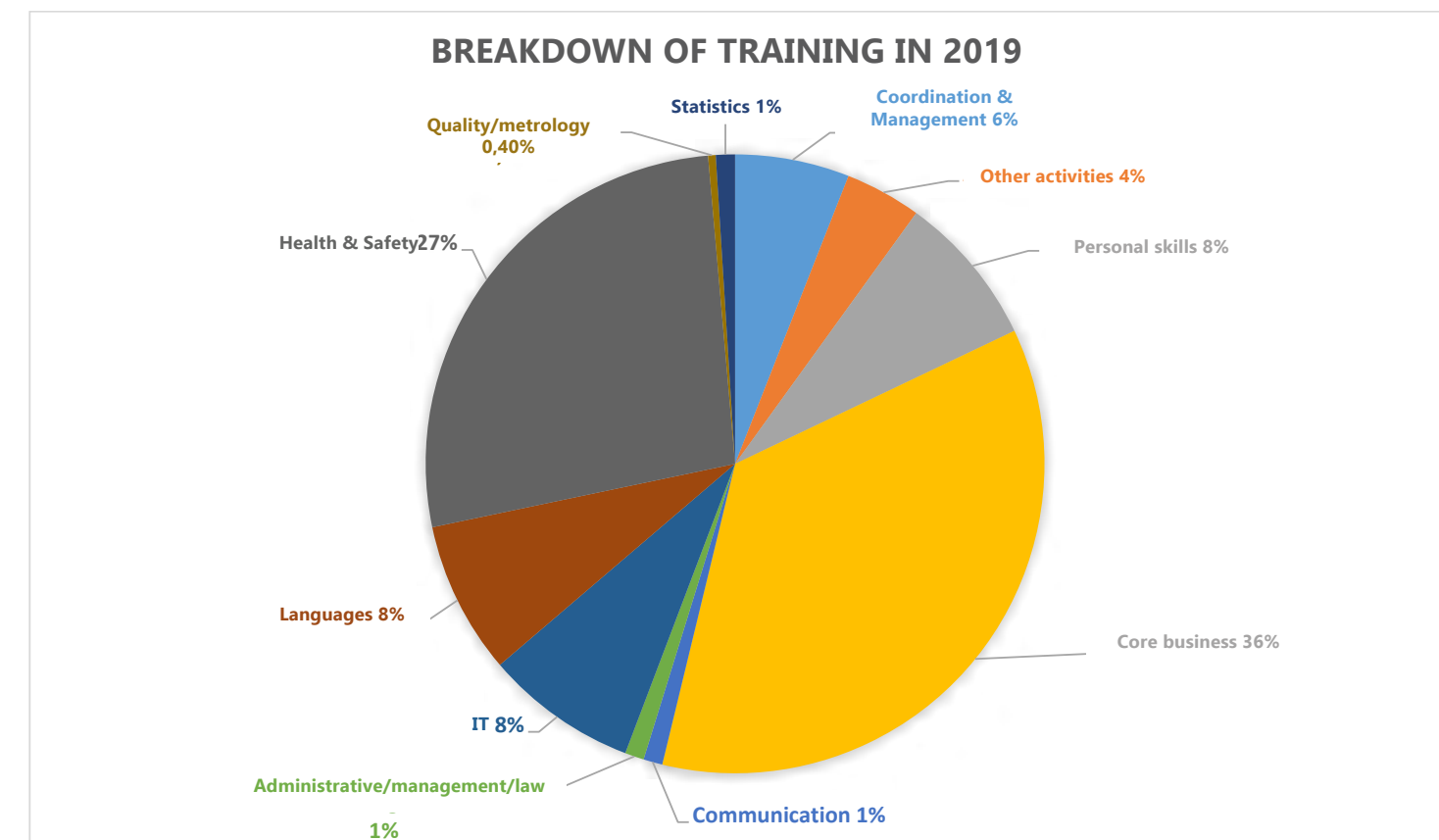


Training courses received by GEVES staff

A total of 142 training courses were held and 250 staff received training time, including:

- 2 work-study contracts
- 31 temporary private status staff
- 1 temporary INRAE staff
- 102 permanent private status staff
- 114 permanent INRAE staff

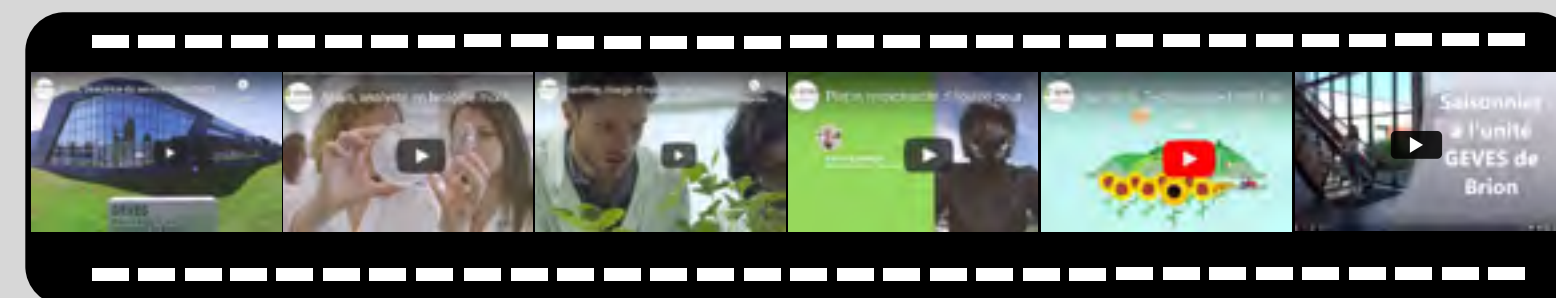
In total: **5140** hours of training carried out by GEVES staff.



WYE = Work Year Equivalent

Average age of permanent staff
46 years

Women 58.2%
Men 41.8%



Watch the GEVES career videos:
<https://www.geves.fr/careers/areas-of-activity-at-geves/>

GEVES: a unique official organisation in France

GEVES is a **Public Interest Group** (Decree of 11 May 1989) founded from three partner organisations:



• The French National Research Institute for Agriculture, Food and Environment (INRAE)
- 60%



• The French Ministry of Agriculture and Food (MAA)
- 20%



• The French Interprofessional Organisation for Seeds and Plants (GNIS)
- 20 %

This unique set-up ensures GEVES's **independence** and **neutrality** in carrying out its activities in accordance with its regulatory and official missions and mandates. The union of state, research and sector expertise ensures that all aspects of the sector are fully taken into account.

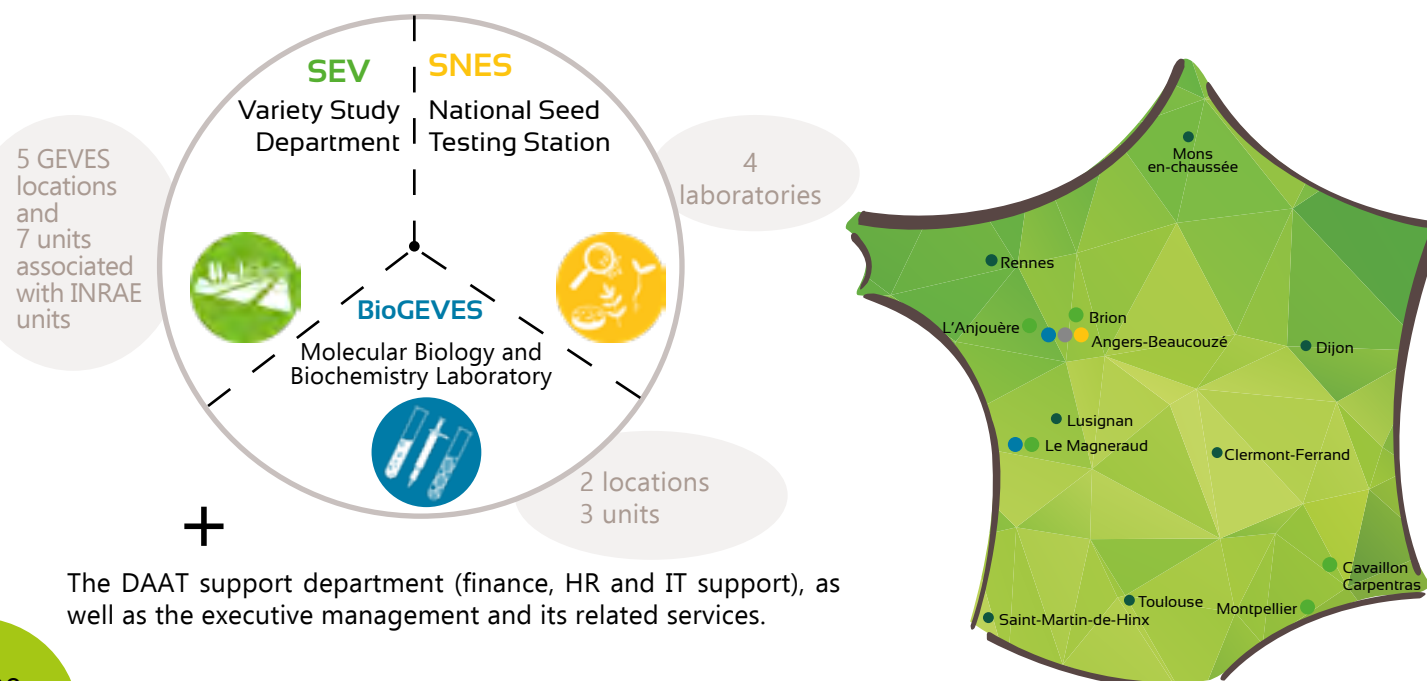
Governance of GEVES

GEVES's Executive Board of Directors is composed of 13 members:

- 6 representatives from INRAE
- 2 representatives from the Ministry of Agriculture and Food
- 2 representatives from GNIS
- 2 staff representatives from GEVES
- The President of the CTPS

as well as a Government Commissioner (Ministry of Research) and a State Controller.

GEVES's operating divisions



GEVES's missions

GEVES has **official, regulatory missions** and carries out testing activities necessary for:

- National listing of new varieties in the Official French Catalogue on behalf of the CTPS and the French Ministry of Agriculture and Food
- Plant variety protection in France (INOV) or Europe (CPVO)
- Seed certification (ordered by the SOC) prior to trade, for species subject to regulatory certification
- Official analyses for territory surveillance
- International trade certification: ISTA orange and blue international certificates, phytosanitary passports and certificates

GEVES is also responsible for the **national coordination of plant genetic resources** on behalf of the Ministry of Agriculture.

GEVES is the **National Reference Laboratory** for:

- GMO detection: GMOs in maize (seed) and soya, rapeseed and flax (seed and vegetative parts) by Decree of 29 December 2015
- Quality testing of seeds and propagating material by Decree of 1 March 2017

GEVES makes its **specialised expertise** openly available to the **plant and seed sectors**, providing high-quality services to a range of private customers.

Activities

To carry out its missions, GEVES performs a wide range of activities:

- Description of varieties and evaluation of genetic progress
- Quality testing for seeds and seedlings
- Methodological research
- Management of plant genetic resources
- Training courses
- Consulting and expertise
- International cooperation
- Monitoring of the French network of seed testing laboratories
- Organisation of Proficiency Tests (PT)

QUALITY

Quality, Recognition & Accreditation

GEVES benefits from a global and harmonised Quality Management System.

GEVES is recognised as follows:

- Certification ISO 9001: version 2015 - BioGEVES and VCUS variety testing (Value for Cultivation, Use and Sustainability)
- Accreditation of GEVES's SNES and BioGEVES laboratories by Cofrac according to ISO 17025 standard:
 - GEVES Beaucouzé: Cofrac N°1-1316 (since 2002).
 - GEVES Le Magneraud: Cofrac N°1-6176 (since 2004).
- Accreditation by ISTA since 2001 (N°FRDL0200) for seed testing
- Entrusted by the CPVO for DUS variety testing since 2012.



Annual Report 2019

Annexes

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- Seed testing 40
- Resources 44
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Variety testing activities



New applications

Year	National listing	National listing with APV*	National PBR	Applications from foreign offices	of which CPVO	Total applications
2015	1164	303	83	1091	569	2 338
2016	1186	241	90	1019	566	2 295
2017	1137	271	145	1061	580	2 343
2018	1179	241	85	953	562	2 217
2019	1108	284	107	1 186	695	2 402

Number of new CTPS, INOV and foreign applications (requests for DUS tests & take over reports) registered in 2019: detail by species group

Species group	National listing 2019	National listing with APV* 2019	National PBR 2019	Applications from foreign offices 2019	of which CPVO 2019
Forest trees	-	-	-	8	6
Fruit species	19	-	34	66	32
Beet and industrial chicory	106	5	-	6	
Cereals	251	-	-	137	58
Rapeseed and other crucifers	91	39	3	80	48
Flax and hemp	13	2	-	18	3
Maize and sorghum	187	35	43	260	84
Forage plants and turfgrasses	86	4	2	52	12
Ornamental plants	-	-	4	217	214
Vegetable species	224	184	-	227	174
Protein plants	29	-	-	15	7
Potatoes	9	-	-	-	
Sunflower and soyabean	49	15	22	99	56
Vine	44	-	-	1	1
TOTAL 2019	1 108	284	107	1 186	695
TOTAL 2018	1 179	241	85	953	

*APV: Provisional authorisation for sale in France

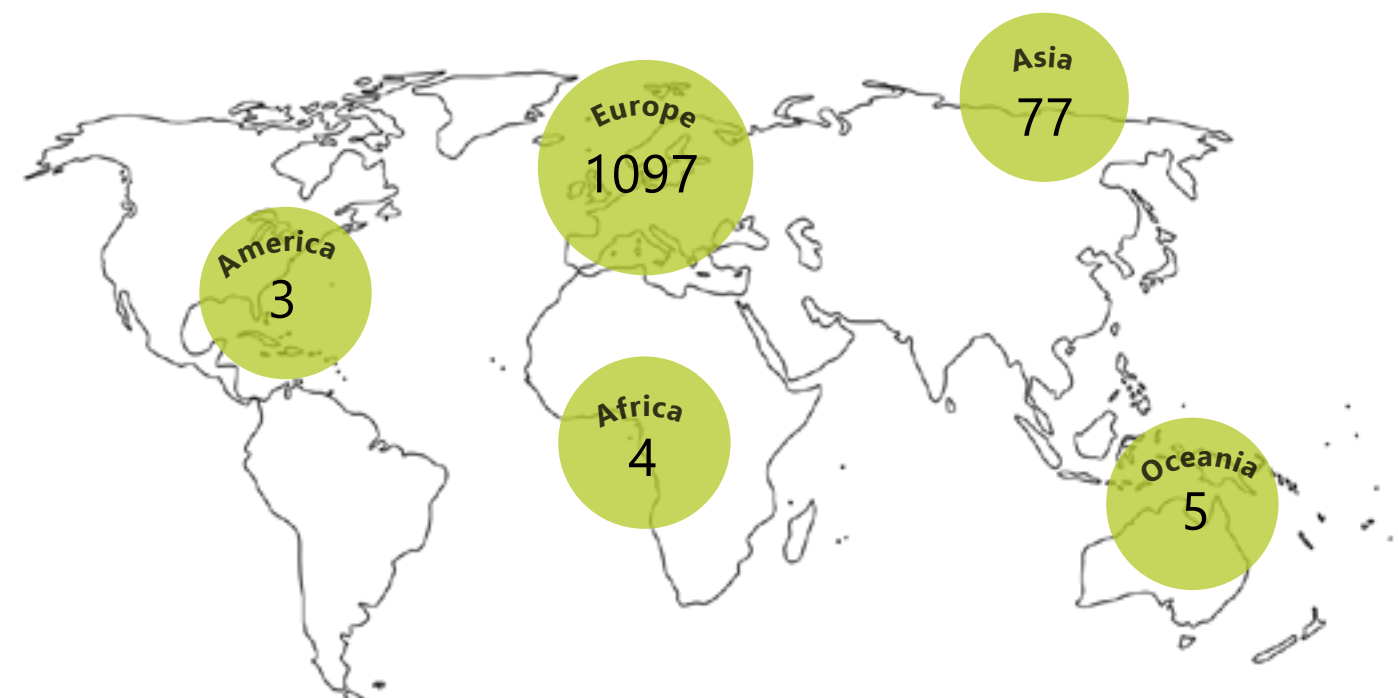
Applications for national listing of new varieties (CTPS) were stable.

The higher number of CTPS applications in 2018 is due to additional applications related to the Brexit special procedure.

The activity for INOV is slightly higher.

DUS applications from foreign countries are increasing mainly due to the increase in ornamental CPVO applications.

FOREIGN APPLICATION REQUESTS



65% of foreign requests are for taking-over of reports.
35% are for conducting new DUS examinations.

The main clients for new examinations are:

- the CPVO: 320 applications with a significant increase explained by the development of GEVES's Ornamental Plant activities,
- Germany: 37 applications
- the Netherlands: 13 applications
- the United Kingdom: 13 applications
- Belgium: 13 applications
- Denmark: 11 applications
- Switzerland: 10 applications

2 - DUS testing



Number of DUS examinations

Species group	Studies conducted by GEVES	Studies delegated (or other French organisations)	Studies contracted abroad	Total studies
Forest trees		6		6
Fruit species	7	282	1	290
Vegetable species	492	6		498
Ornamental plants	234	3		237
Beet and industrial chicory	17	173		190
Cereals	434	1	14	449
Rapeseed and other crucifers	345		8	353
Flax and hemp	24			24
Maize and sorghum	709			709
Forage plants and turfgrasses	107		223	330
Protein plants	49			49
Potatoes			13	13
Sunflower and soyabean	229			229
Vine		82		82
TOTAL 2019	2 647	553	259	3 462
Total 2018	2 675	496	274	3 445

DUS activities remained stable: the increase in ornamental trials was offset by slight declines in other species. The number of species in DUS activities increased from 123 in 2018 to 145 in 2019.

DUS Reference Collection

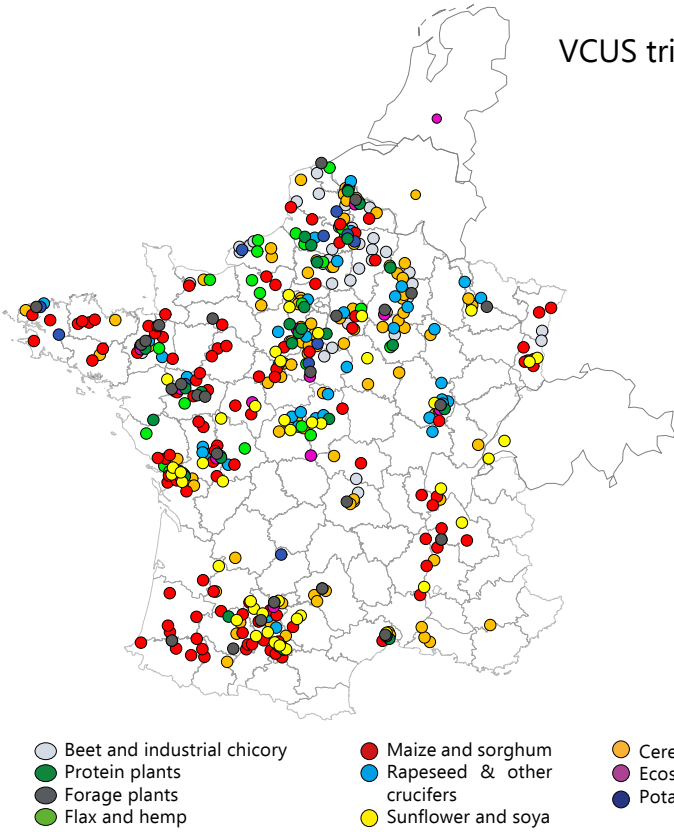
Total no. varieties in collection	2019
Beet and industrial chicory	1 653
Cereals	4 857
Rapeseed and other crucifers	2 451
Flax and hemp	227
Maize and sorghum	9 975
Forage plants and turfgrasses	934
Protein plants	801
Sunflower and soyabean	3 067
Total agricultural species	23 965
Vegetable species	28 422
Ornamental species maintained <i>in vivo</i> at GEVES	3 818
TOTAL GENERAL	56 205

3 - VCUS tests



Number of VCUS examinations

Species group	No. of VCUS studies				Total	% total
	1st year	2nd year	3rd year	4th year		
Beet and industrial chicory	104	58	0	0	162	12%
Cereals	228	133	0	0	361	27%
Rapeseed and other crucifers	92	41	0	0	133	10%
Flax and hemp	11	9	0	0	20	2%
Maize and sorghum	155	86	1	0	242	18%
Forage plants and turfgrasses	92	100	74	0	266	20%
Protein plants	31	12	0	0	43	3%
Potatoes	5	13	0	0	18	1%
Sunflower and soyabean	38	15	1	0	54	4%
Ecosystemic plants	9	8	0	0	17	1%
TOTAL	765	475	76	0	1 316	100%
Total in 2018	800	409	80	0	1 289	



Field crops and forage



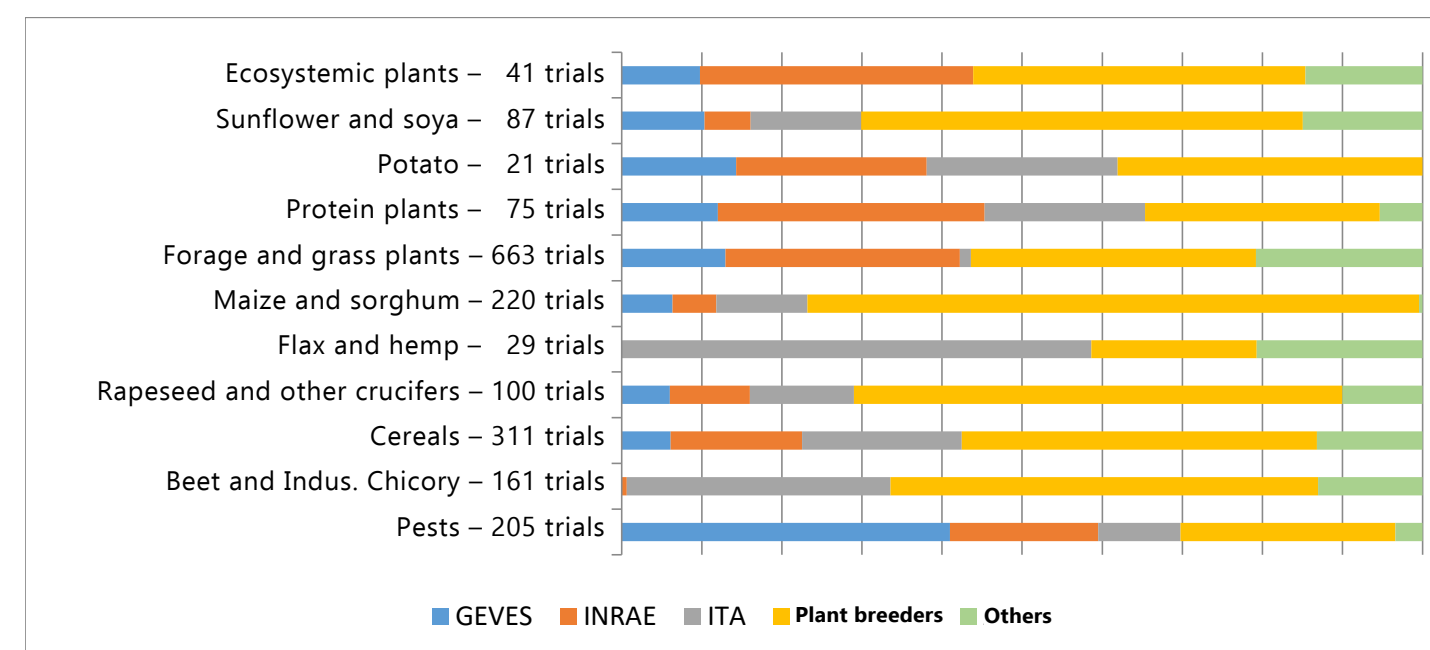
European grass network

- 1,913 VCUS trials
- 1,447 trials for assessing overall value
 - 403 trials for the study of specific characteristics (behaviour in relation to pests, diseases, lodging, cold, earliness, etc.).
 - 63 trials at the request of the breeder to check one or more varietal characteristics (pest tolerance, specific quality profiles, behaviour in certain environments, etc.). This concerns almost 10% of the candidate varieties.

VCUS laboratory tests

Species group	Bio GEVES	Partner laboratories	SNES	Total no. tests	Main types of tests
Beet and industrial chicory	96	13 496	439	14 031	Sugar beet: sugar content, alpha-amino nitrogen content, potassium content, sodium content. Nematodes. HS1pro1 gene. Varietal control (monogermia, ploidy). Fodder beet: soluble dry matter content. Chicory: soluble dry matter and asparagine.
Cereals	272	14 325	270	14 867	Barley & wheat diseases: Elisa mosaic tests. Triticale & wheat diseases: Fusarium and Microdochium identification. Oat: TSW, protein, colour, almond fineness. Durum wheat: protein, Grain specific weight, TKW, LMW, grain hardness, mitadinage, yellow rate, speckle, sedimentation test (SDS). Wheat: protein, Grain specific weight, Hagberg, wet gluten et gluten index, grain hardness, Chopin alveograph, French bread-baking test, improver wheat test, cookie baking test, the EC machinability test for bread-making wheat. Barley: Grain specific weight, protein, calibration, dormancy, micromalting. Triticale: protein, Grain specific weight, viscosity. Rice: machining yield analysis (whole and milled), grain biometry (length and width).
Rapeseed and other crucifers	3 347	3 160	1 468	8 075	Oil, glucosinolates, proteins and fatty acids content. Clubroot resistance (rapeseed).
Flax and hemp		1 398		1 398	Oil, proteins, omega 3, fibre quality.
Maize and sorghum	84	3 143	110	3 337	Fodder food value, fat (oil-rich varieties), tannin content.
Forage and grass plants		3 361	63	3 424	Alfalfa: feed value (Protein and fiber content), Ditylenchus, Verticillium, Colletotrichum Vetch (Vicia), forage pea: Protein content. Grasses: feed value (Protein, fibre and sugar content). Ryegrass Italian and hybrid, Brome-grass, Festulolium: Xanthomonas.
Protein plantes	631	56		687	Protein content, trypsin inhibitor activity, fat content, vicine and convicine content
Potato		18	170	188	Cooking quality, colour changes from frying. Nematodes.
Sunflower and soya	2 044	381	81	2 506	Oil, oleic acid, protein Mildew
Ecosystemic plants		479		479	Protein content, carbon-nitrogen ratio, nematodes (crucifers).
TOTAL 2019	6 474	39 817	2 601	48 992	
Total 2018	5 573	35 880	2 994	44 447	

VCUS networks: multipartner networks



Pests: pest tests on cereals, rapeseed, potato, sunflower

ITA: Technical Agricultural Institutes

Others: professional organisations, agricultural schools and colleges, trade cooperatives, foreign counterparts.

4 - Variety controls

Species groups	No. of SOC lots tested
	2019
Beet and industrial chicory	58
Cereals (rye and buckwheat)	31
Rapeseed and crucifers	741
Flax and hemp	235
Sorghum	86
Forage plants and turfgrasses	615
Vegetable species	170
Shallots	124
Protein plants	520
Sunflower and soyabean	1 209
Total	3 789
Total in 2018	3 274

Variety controls are mainly carried out on behalf of the SOC for certification to verify variety identity and purity.

3,789 lots were checked for the SOC: the increase is explained by an increase in sunflower volume.

For maize, controls are carried out by INRAE and FNPSMS; and for cereals, by Arvalis. GEVES's role is to provide the corresponding reference samples (1100 batches in 2019).

133 controls were also carried out for other clients.

Varieties registered in the French National Listing in 2019

Agricultural species	Catalogue lists			TOTAL
	A	B	P	
Fodder beet	4			4
Sugar beet	20	12		32
Industrial chicory	4			4
Beet and industrial chicory	28	12		40
Spring Oat	4			4
Winter Oat	3			3
Spring Naked Oat	1			1
Winter Naked Oat	2			2
Black Oat	3			3
Durum wheat	1			1
Winter wheat	1			1
Soft winter wheat	27	8		35
2 row spring barley	9	4		13
2-row winter barley	3	1		4
6-row winter barley	15	2	4	21
Triticale	8	1		9
Cereals	77	16	4	97
Winter oilseed rape	30	24		54
White mustard	1			1
Brown Mustard	2			2
Rapeseed and other crucifers	33	24		57
Hemp	2			2
Spring flax	1			1
Spring linseed	2			2
Flax & hemp	5			5
Maize	50	31		81
Fodder Sorghum	3			3
Sorghum	4	3		7
Maize & sorghum	57	34		91
Tall fescue	5			5
Slender creeping red fescue	2			2
Chewings fescue	2			2
Strong creeping red fescue	2			2
Turfgrass perennial ryegrass	5			5
Cocksfoot	3			3
Meadow fescue	1			1
Tall fescue	7			7
Fodder perennial ryegrass	10	1		11
Italian ryegrass (annual type)	2	1		3
Italian ryegrass	3	1		4
Hybrid ryegrass	4			4
Lucerne	5			5
Winter forage pea	1			1
White clover	3	1		4
Balansa clover	1			1
Squarrose clover	1			1
Red clover	1			1
Spring common vetch	1			1
Winter common vetch	1			1
Forage & grass plants	60	4		64
Spring field bean	2			2
Winter field bean	5			5
Spring protein pea	19	1		20
Winter protein pea	3	1		4
Protein plants	29	2		31
Edible potato	9			9
Starch Potato	1			1
Potatoes	10			10
Soyabean	8	1		9
Sunflower	9	8		17
Sunflower & soyabean	17	9		26
Subtotal for agricultural species	316	101	4	421

Varieties registered by order of the Ministry of Agriculture and Food, on the proposal of the CTPS and based on the evaluations carried out by GEVES, on the following lists:

A: Agricultural varieties whose seed can be multiplied and marketed in France and the EU

B: Agricultural varieties whose seeds can be multiplied in France for export outside the EU

C: Conservation varieties grown in specific regions, threatened by genetic erosion and marketable in the region of origin

P: Hybrid components



Vegetable species	Catalogue lists				TOTAL
	a.	b.	c.	d.	
Aubergine				1	1
Red beet	2				2
Carrot	4				4
Celery	1				1
Chicory - Witloof (endives), and broad-leafed (Italian chicory)	4				4
Curly endive / Escarole endive	2				2
Kale	2				2
Broccoli	10				10
Cabbage	3				3
Brussel sprout	2				2
Savoy cabbage	1				1
Cauliflower	11				11
Cucumber / Pickle	3				3
Courgette	8				8
Bean	13				13
Spanish bean	1				1
Lettuce	68				68
Vegetable maize	7	2		1	10
Melon	20				20
Watermelon	1			1	2
Spring Turnip / Autumn Turnip	1				1
Chilli / Pepper	8		1		9
Poirée	1				1
Vegetable peas	1				1
Chickpea	3				3
Radish	1				1
Radish rave				2	2
Tomato	31	1		1	33
Rootstock <i>Solanum lycopersicum</i> x <i>solanum habrochaites</i>	2				2
Total vegetable species	211	3	1	6	221

a: Varieties whose seed may be certified "basic seed" or "certified seed" or controlled as "standard seed" and marketed in France.

b: Varieties whose seed can be controlled only as "standard seed" and marketed in France.

c: Conservation varieties grown in specific regions, threatened by genetic erosion and marketable in their region of origin

d: Varieties without intrinsic value for commercial production but created to meet specific growing conditions and marketable in France.

Fruit species	Catalogue lists		TOTAL
	1	2	
Apricot	7		7
Sweet cherry	2		2
Peach	25		25
Apple	9		9
Japanese plum	1		1
Total fruit species			44

List 1 = Varieties with an Official Description, whose plants can be marketed and certified within the EU.

List 2 = Varieties with an Officially Recognised Description, whose plants can be marketed and certified within the EU.

Vine species	Catalogue lists		TOTAL
	A	B	
Vine	4		4
Total fruit species			4

List A: varieties whose propagating material may be marketed within the European Union.

List B: varieties whose propagating material can be produced in France for export to third countries.

TOTAL varieties registered in the French Catalogue in 2019:

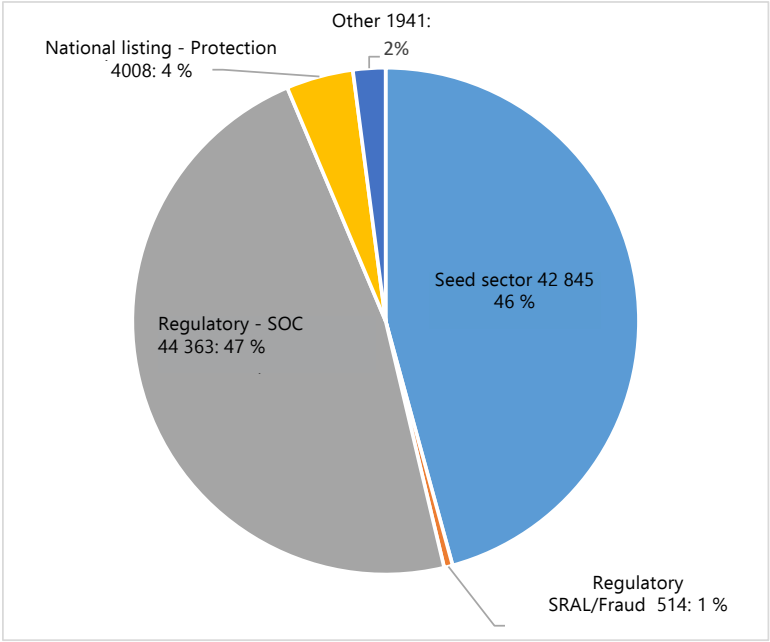
Agricultural + vegetable + fruit + vine varieties = **690**

To see all the varieties registered in the Official French Catalogue: <https://www.geves.fr/catalogue/>

Seed testing

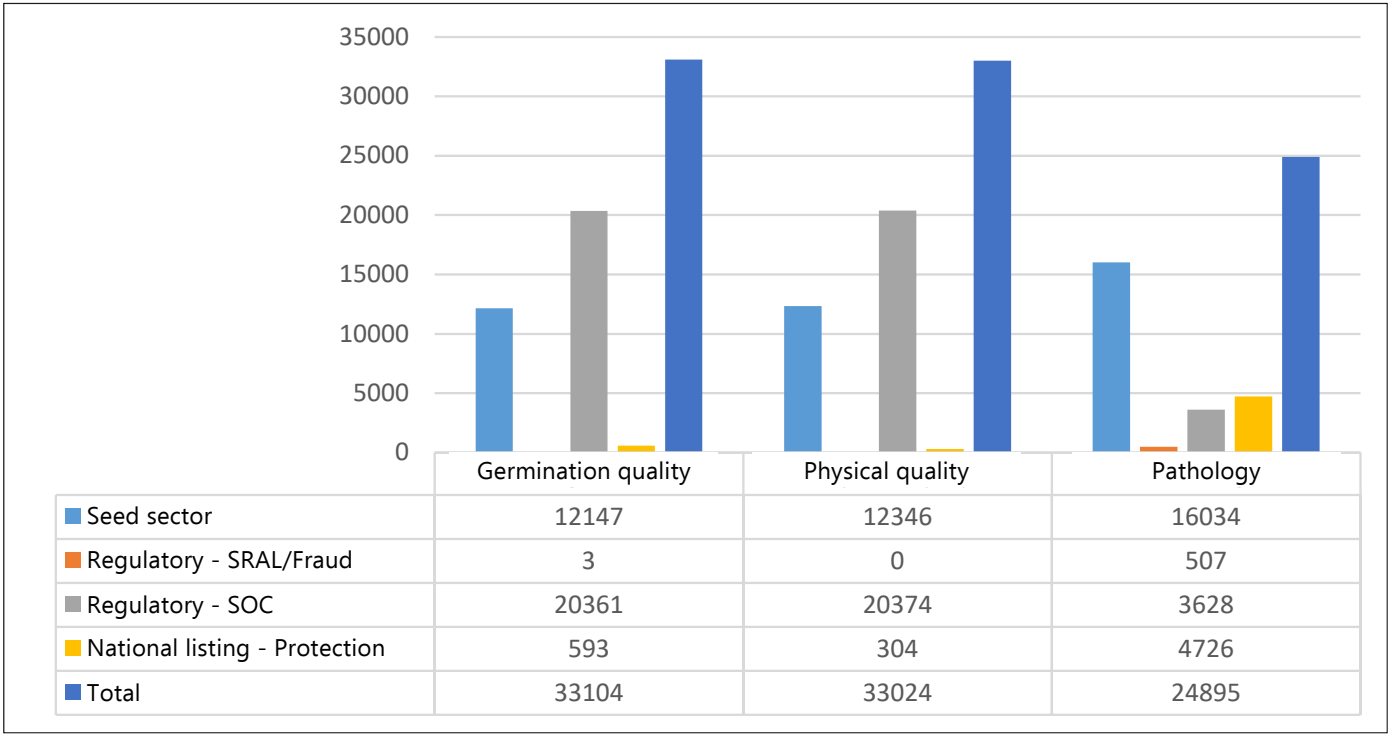
Breakdown of tests performed in 2019

Regulatory tests account for more than 50% of activities.
A large part of testing is carried out to support seed exportation: Orange International Certificates (OIC) and Blue International Certificates (BIC), pest detection, counting of invasive plant species, phytosanitary certification, germination quality testing, etc.



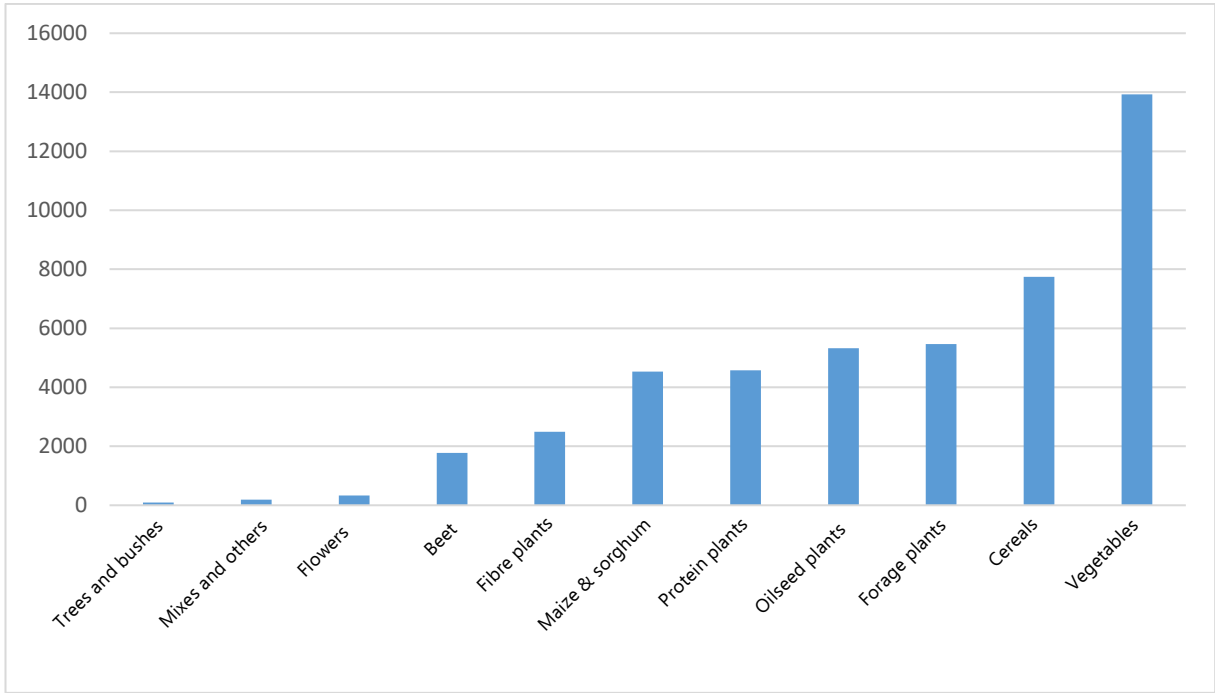
- Regulatory - SOC: tests at the request of the SOC for certification of commercial batches, monitoring of recognised corporate laboratories or commercial and regional controls
- Regulatory – Regional Food Service-Fraud: tests on demand for government services
- National listing-Protection: tests commissioned by the CTPS for variety listing and by the CPVO or INOV for variety protection
- Seed sector: tests at the request of private operators for R&D, production or national/international trade (15% OIC)
- Other: Tests carried out as part of the development and validation of new methods, studies and PTs.

Number of tests performed in 2019 by laboratory and by order type



The physical analysis and germination laboratories perform testing mainly for certification and ISTA certificates. The pathology laboratory carries out testing for private clients, in support of seed exportation (notably phytosanitary certification) or R&D. With GEVES’s ToBRFV accreditation and the forthcoming status of NRL Plant Health (seed matrix), the number of regulatory/official tests should increase significantly in the pathology laboratory.

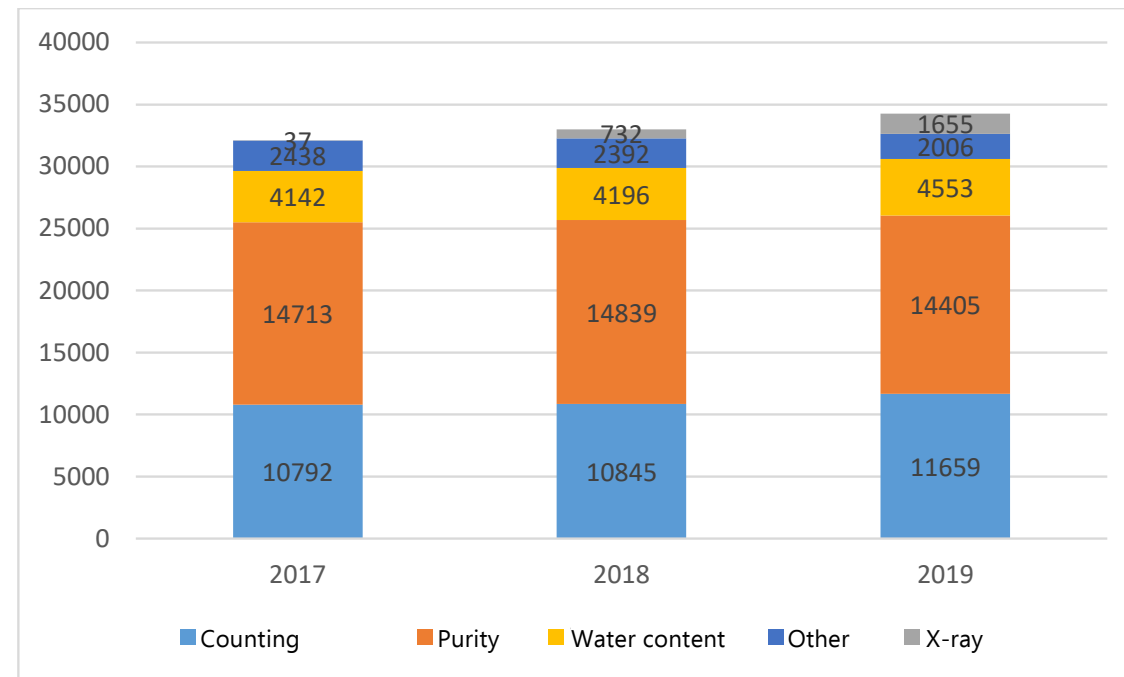
Breakdown of test requests by species group



ACTIVITIES BY LABORATORY

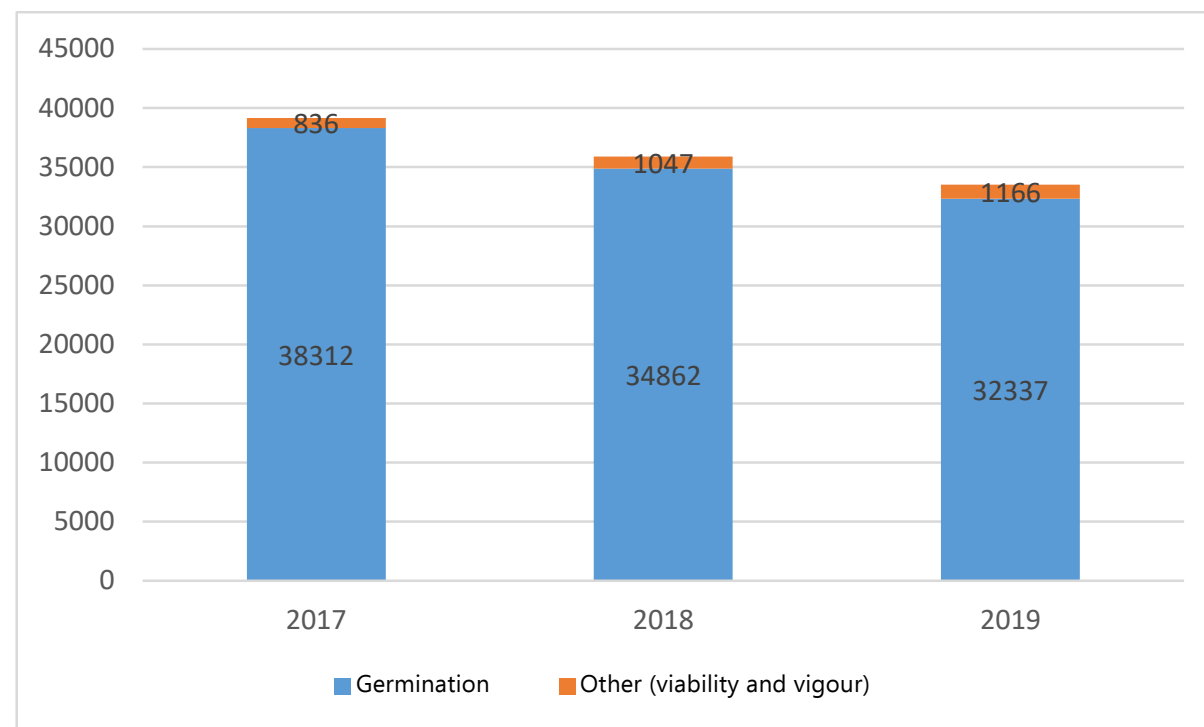
Breakdown of tests carried out at the Physical Analysis Laboratory

In 2019, more than 33,000 tests were carried out, an increase of 2% compared to 2018.



Breakdown of tests carried out at the Germination Quality Laboratory

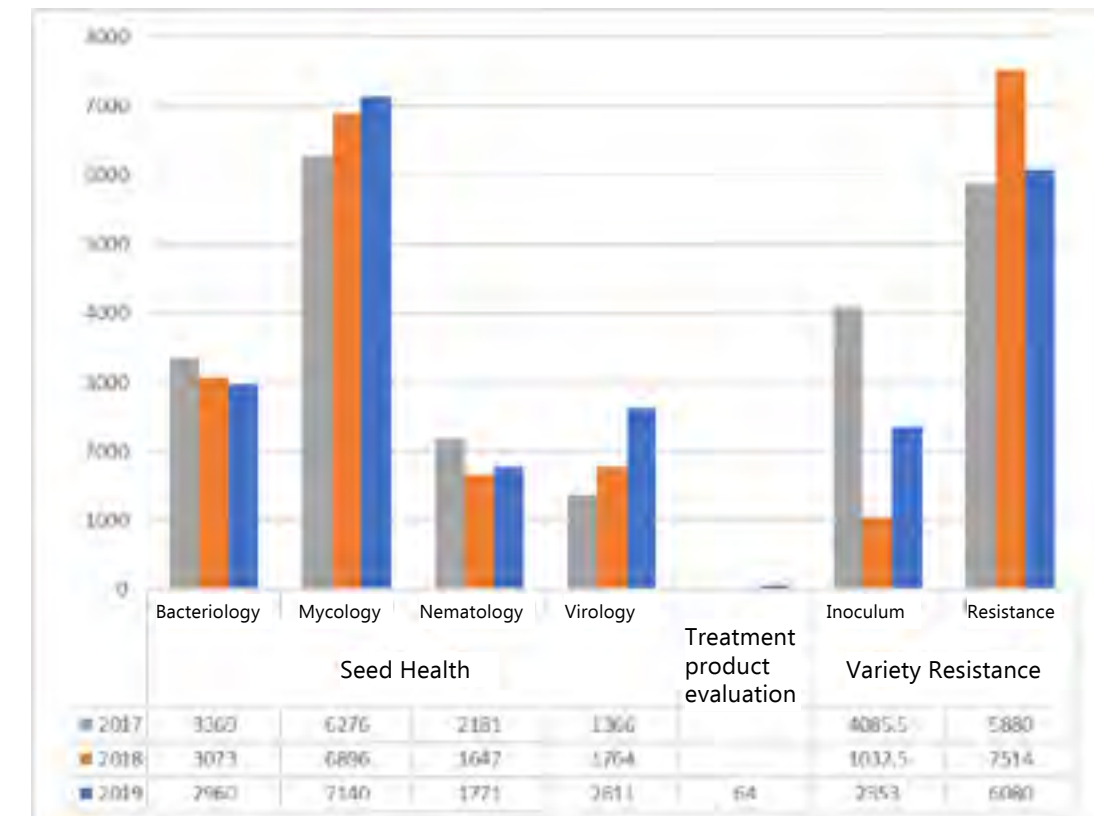
In 2019, more than 33,000 tests were carried out. 62% for regulatory tests, which remain stable in number, in contrast to the number of "sector" tests, which will be lower in 2019.



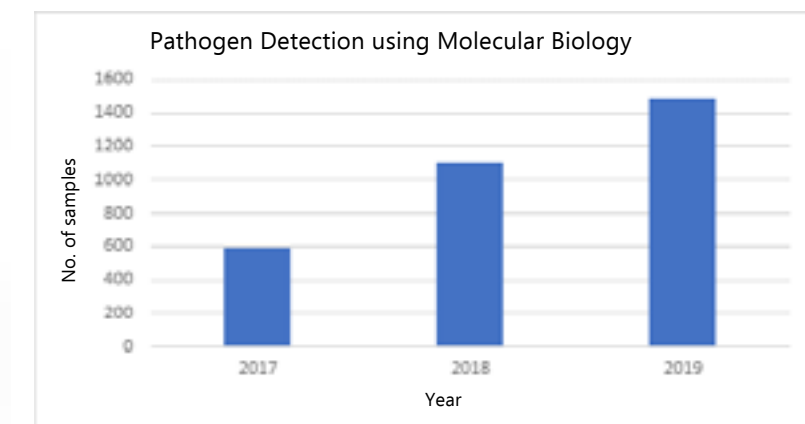
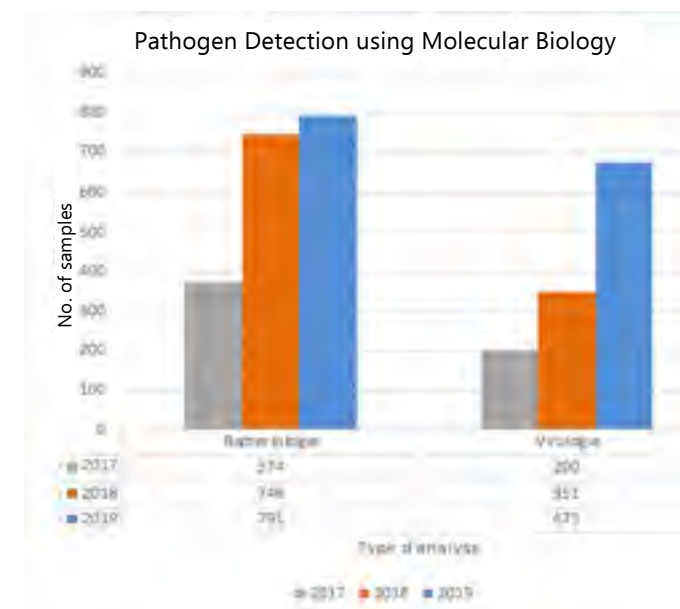
For the germination and physical analysis laboratories, there has been an increase in phenotyping services (germination benches, ElonCam, tomography, 2D x-ray, ...).

Breakdown of tests carried out at the Pathology Laboratory

In 2019, there was a sharp increase of activity in virology and mycology and a further increase in inoculum production.



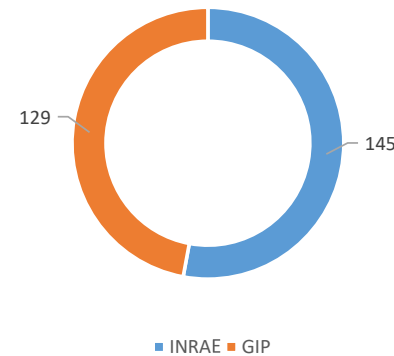
Pathogen detection using Molecular Biology at the BioGEVES laboratory



Resources

Human Resources Statistics

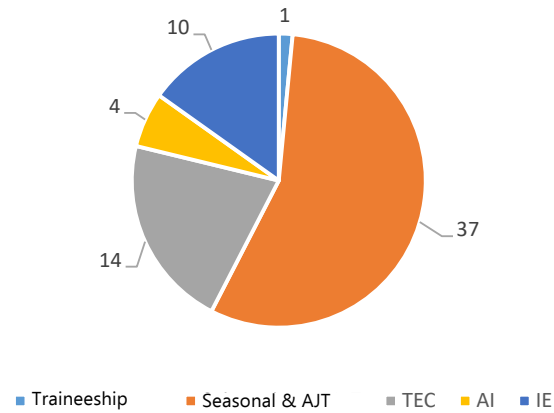
Permanent staff on 31 12 2019



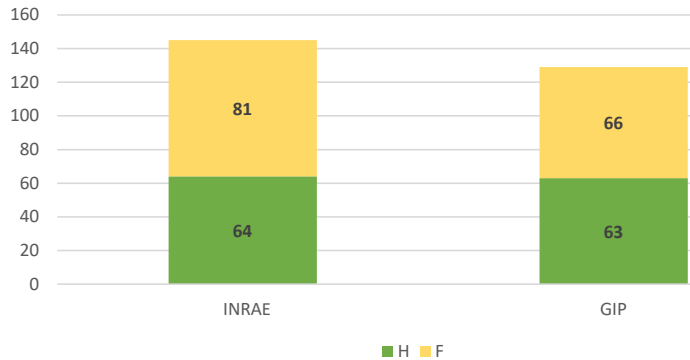
Permanent FTE staff on 31 12 2019



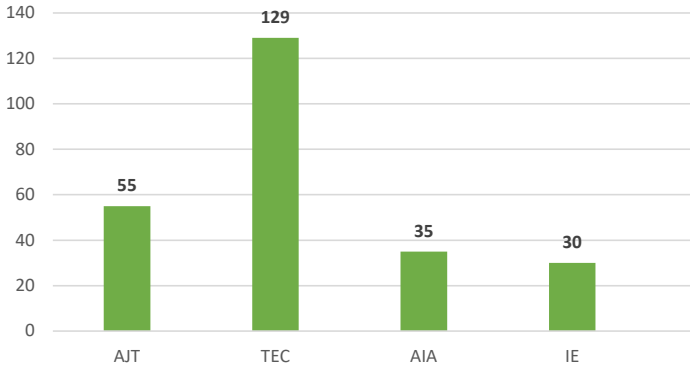
Temporary staff: Breakdown by type



Male/Female distribution

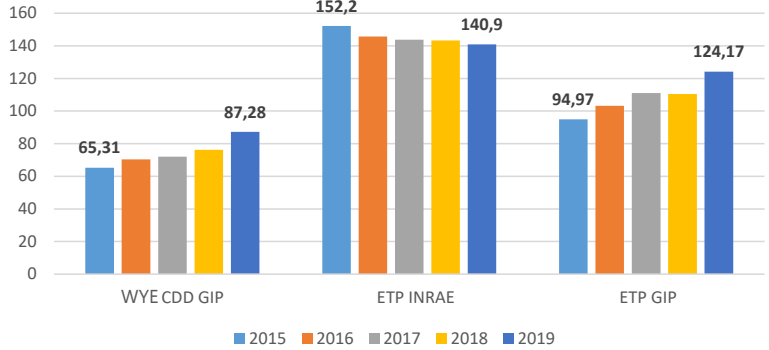


Permanent staff: Breakdown by grade

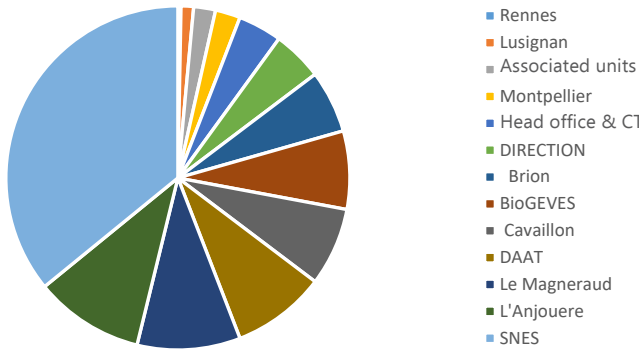


Gender Equality Index
Score (GIP):
83 / 100

EVOLUTION BY STATUS



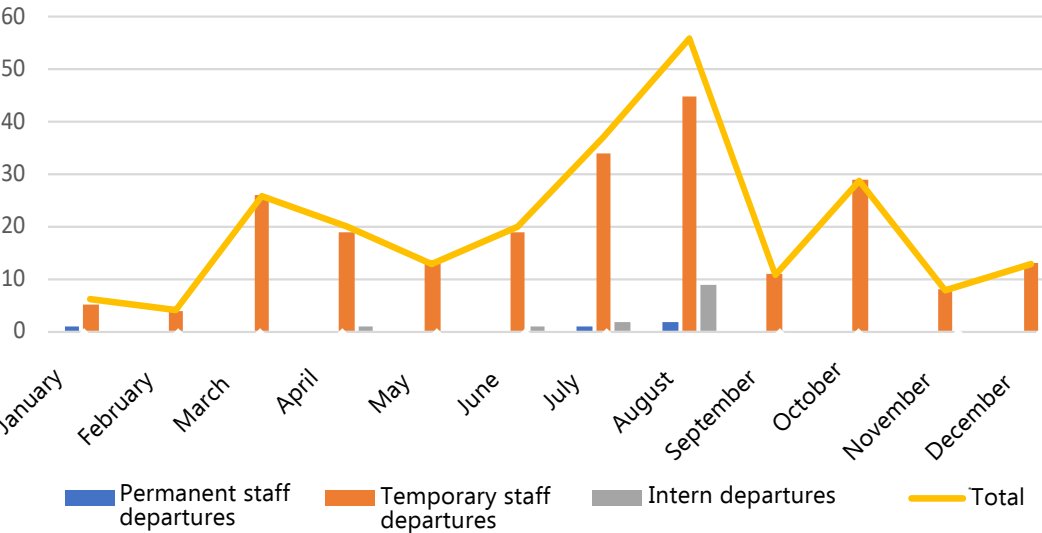
Distribution of staff per unit (incl. temporary staff)



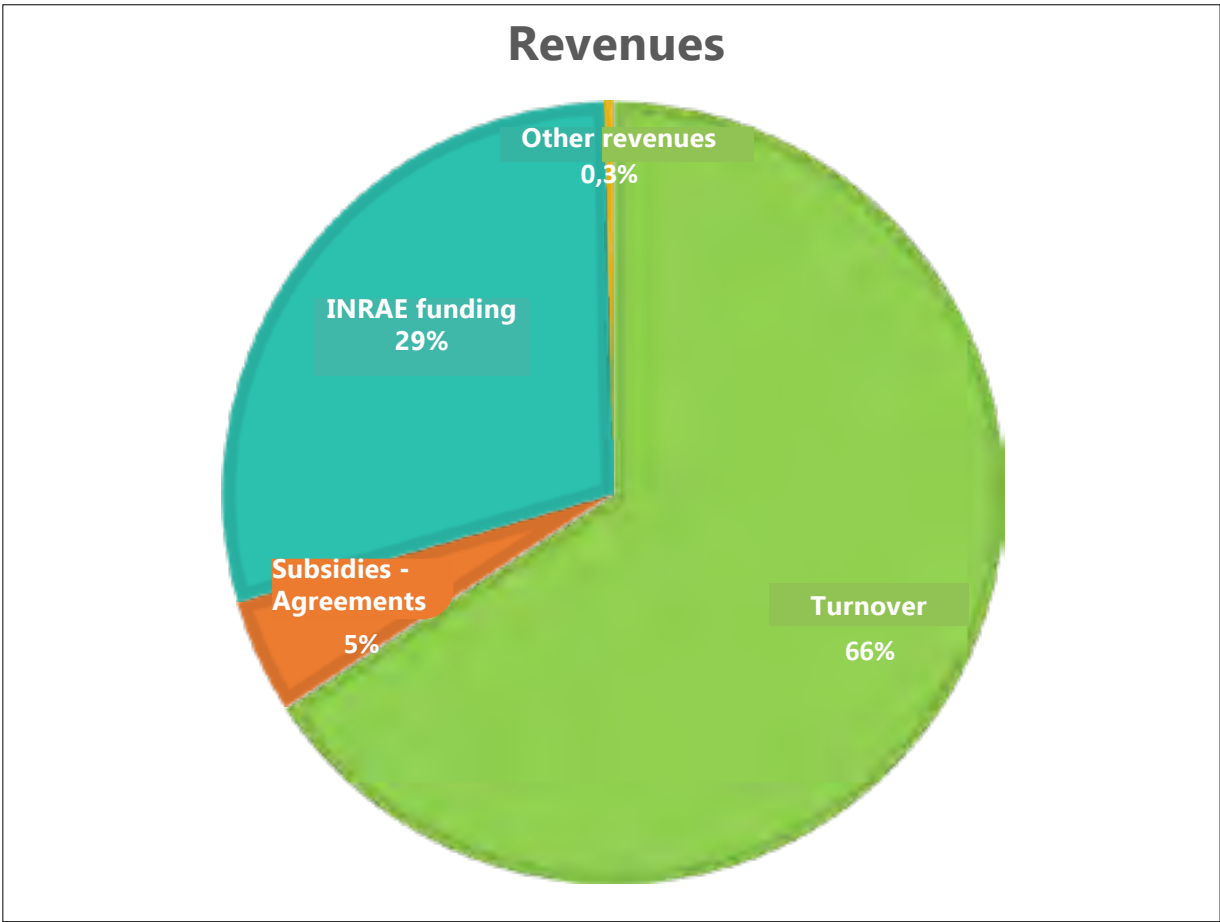
GIP (private status) staff arrivals



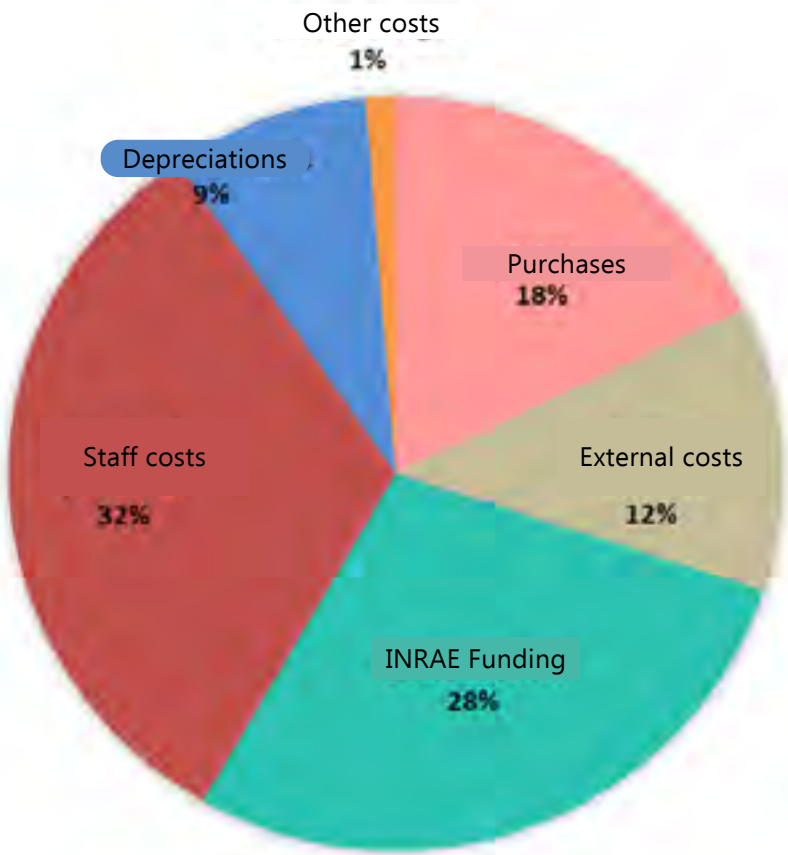
GIP (private status) staff departures



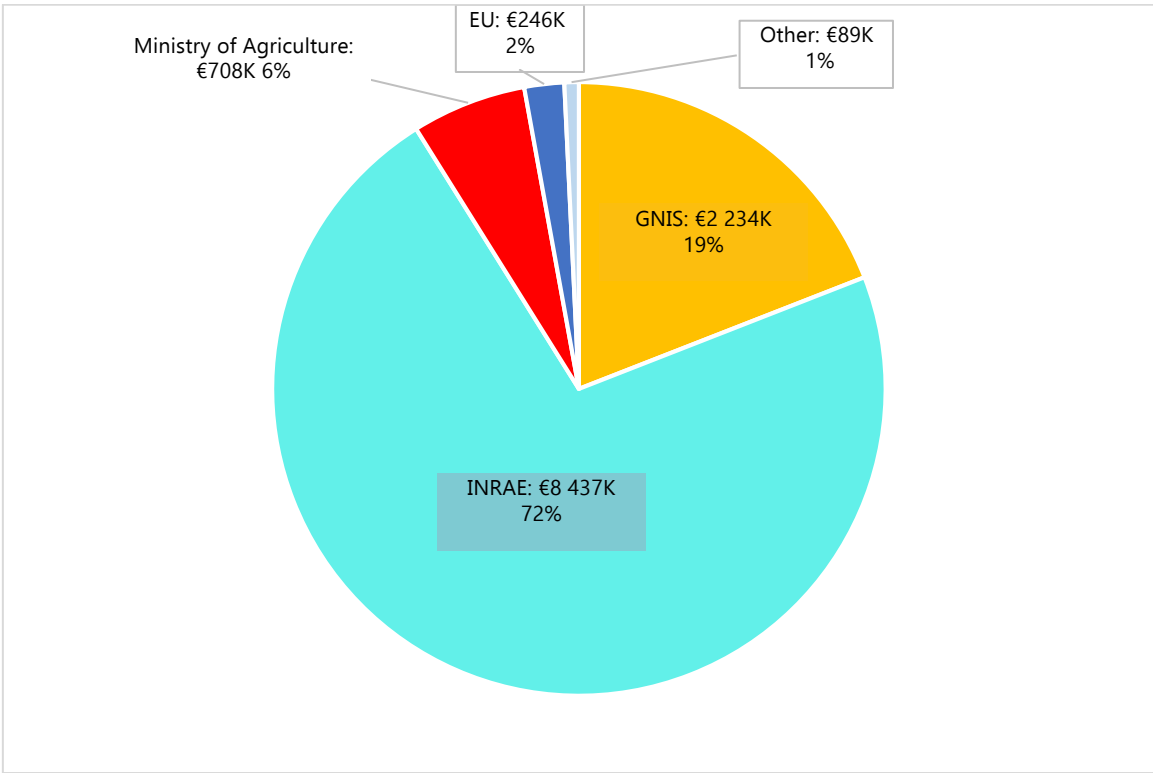
Budget statistics



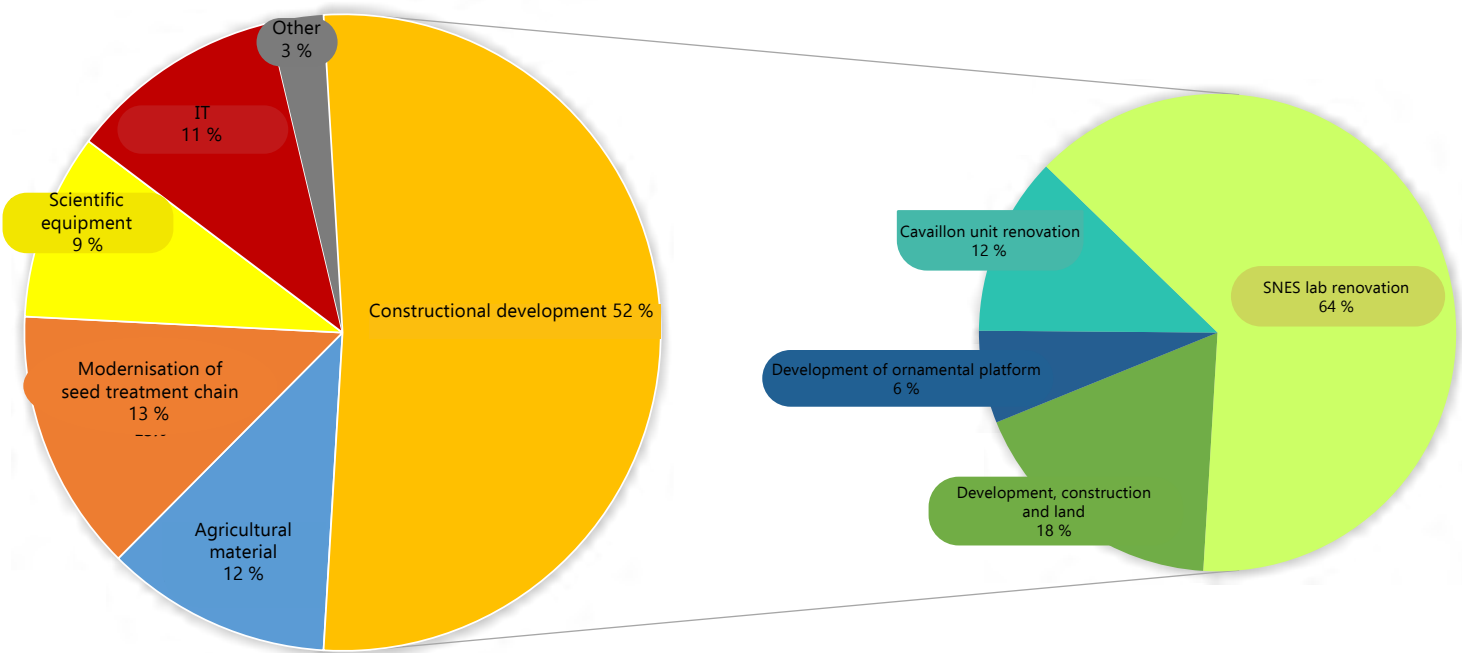
Operating costs



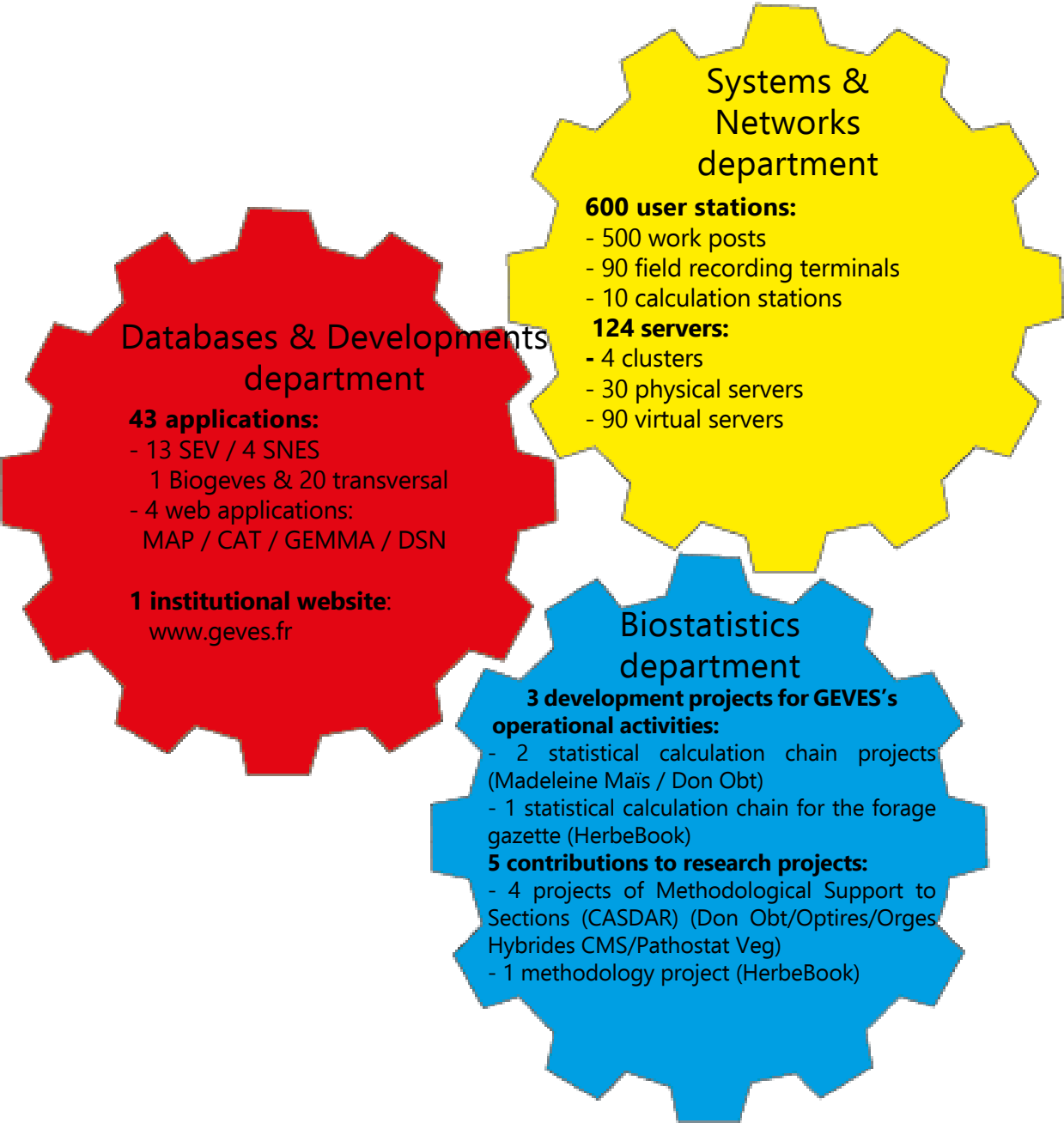
Contribution from GEVES's founding members and other bodies



Investments 2019



Figures on IT data and applications



GEVES's Resources (Buildings, experimental fields, etc.)

GEVES station	Laboratory surface area (m²)	Surface area of cold rooms, growing rooms (m²)	Surface area of greenhouses and tunnels (m²)	Field surface area (excluding buildings, paths, structures and shelters) (ha)	Rented surface area (long-term or temporary) (ha)
Beaucouzé	2322	910	430		
Anjouère			360	175.1	19.4
Brion		100	3870	26.2	2.4
Le Magneraud	365	590		73.9	59
Montpellier				39.6	1.5
Cavaillon-Carpentras		146	7655	57.5	
TOTAL	2687	1746	12 315	372.3	82.3

GEVES station	Surface area of trials (ha)	% DUS & CV trial surface area	% VCUS trial surface area	% surface area of other trials	Number of species testing
Beaucouzé					
Anjouère	80	67	31	2	53
Brion	8.2	95		5	52
Le Magneraud	39.6	86	13	1	11
Montpellier	9	72	28		26
Cavaillon-Carpentras	12.3	100			37
TOTAL	149.1				

Within the framework of the INRAE-GEVES General Experimental Agreement, renewed in 2019 for 5 years, 11 INRAE experimental units and 3 INRAE research units perform DUS and VCUS testing.

Glossary

<p>A</p> <p>AFNOR: French national organisation for standardisation</p> <p>ANSES: French Agency for Food, Environmental and Occupational Health & Safety</p> <p>APV: Provisional authorisation for sale in France</p> <p>ASFIS: Association for training of seed industry professionals</p> <p>B</p> <p>BioGEVES: GEVES Biochemistry and Molecular Biology Laboratory</p> <p>BIA: Pests</p> <p>BIO: See IOC</p> <p>BMT: UPOV working group on biochemical and molecular techniques</p> <p>BRG: French Genetic Resources Bureau</p> <p>BSA: Bundessortenamt (German counterpart)</p> <p>BSPIC: French Seed and Integrated Pest Management Office</p> <p>C</p> <p>CASDAR: Special Allocation Fund for Agricultural and Rural Development</p> <p>CEPP: Plant protection product saving certificate</p> <p>CIR: Research Tax Credit</p> <p>CIRAD: French Agricultural Research and International Development Organisation</p> <p>CISAB: CTPS Commission for Organic Agriculture</p> <p>CISPS: CTPS Commission for Ecosystemic Plants</p> <p>COFRAC: French Accreditation Committee</p> <p>COV: Certificat d'Obtention Végétale</p> <p>CPPSI: Collaboration for Plant Pathogen Strain Identification</p> <p>CPVO: Community Plant Variety Office</p> <p>CRPM: French Rural and Maritime Fisheries Code</p> <p>CRGAA: FAO Commission on Genetic Resources for Food and Agriculture</p> <p>CTIFL: French Interprofessional Technical Centre for Fruit and Vegetables</p> <p>CTPS: French Permanent Technical Committee for plant breeding</p> <p>CV: Variety check</p> <p>D</p> <p>DAAT: Technical Support Service (GEVES)</p> <p>DEE: Foreign application for study</p> <p>DGAL: French Directorate General for Food (Ministry of Agriculture)</p> <p>DGCCRF: French Directorate General for Competition Policy, Consumer Affairs and Fraud Control</p> <p>DHS: See DUS</p> <p>DOR: Officially Recognised Description</p> <p>DSN: GEVES website for seed testing requests</p> <p>DUS: Distinctness Uniformity Stability</p> <p>E</p> <p>EIL: See PT</p> <p>ECpGR: European Cooperative programme for Plant Genetic Resources</p> <p>ELISA: Immuno-enzymatic method</p> <p>ETP: See FTE</p> <p>ETPT: See WTE</p> <p>F</p> <p>FAO: Food and agriculture organization of the United Nations</p>	<p>FEDER: European Economic and Regional Development Fund</p> <p>FRB: French Foundation for Research on Biodiversity</p> <p>FSOV: Plant Breeding Support Fund</p> <p>FSRSO: Support Fund for Oilseed Research</p> <p>FTE: Full time equivalent</p> <p>FUI: Single Inter-Ministry Fund</p> <p>G</p> <p>GEVES: French Variety and Seed Study and Control Group</p> <p>GIP: Public Interest Group</p> <p>GNIS: French Interprofessional Organisation for Seeds and Plants</p> <p>I</p> <p>IBISA: Infrastructure in Biology, Health and Agronomy</p> <p>IBEB: French Institute of Environmental Biology and Biotechnology</p> <p>INOV: French National Office for Plant Breeders' Rights</p> <p>INRAE: French National Research Institute for Agriculture, Food and the Environment</p> <p>INVITE: INnovations in plant Variety Testing in Europe to foster the introduction of new varieties better adapted to varying biotic and abiotic conditions and to more sustainable crop management practices.</p> <p>IOC: International Orange Certificate (ISTA)</p> <p>IRHS: Research Institute for Horticulture and Seeds</p> <p>ISHI: International Seed Health Initiative</p> <p>ISO: International Organisation for Standardization</p> <p>ISF: International Seed Federation</p> <p>ISTA: International Seed Testing Association</p> <p>ITAB: French Technical Institute for Organic Agriculture</p> <p>ITEIPMAI: Interprofessional Technical Institute for Perfumer, Medicinal and Aromatic Plants</p> <p>ITPGRFA: International Treaty on Plant Genetic Resources for Food and Agriculture</p> <p>L</p> <p>LBPV: Laboratory of Plant Biology and Physiology</p> <p>LED: Light Emission Diode</p> <p>LIMS: Laboratory Information Management System</p> <p>LNR: See NRL</p> <p>M</p> <p>MAA: French Ministry of Agriculture and Food</p> <p>MATREF: French National Network of Reference Material</p> <p>N</p> <p>NAKT: Naktuinbouw (Dutch counterpart)</p> <p>NBT: New Breeding Techniques</p> <p>NIAB: National Institute of Agricultural Botany (British counterpart)</p> <p>NIRS: Near Infra Red Spectrometry</p> <p>NRL: National Reference Laboratory</p> <p>O</p> <p>OAPI: African Intellectual Property Organization</p>	<p>OECD: Organisation for Economic Cooperation and Development</p> <p>OCVV: See CPVO</p> <p>P</p> <p>PCR: Polymerase Chain Reaction</p> <p>PGR: Plant Genetic Resources</p> <p>PHENOTIC: Instrumentation and imaging platform for seeds and plants</p> <p>POPAM: Ornamental, Aromatic and Medicinal Plants</p> <p>PT: Proficiency Test</p> <p>Q</p> <p>qPCR: Method for measuring the initial amount of DNA</p> <p>R</p> <p>RNE: French National VCUS Testing Network</p> <p>RNQP: Regulated Non-Quarantine Pests</p> <p>RT-PCR: Real Time Polymerase Chain Reaction</p> <p>S</p> <p>SEV: GEVES Variety Study Department</p> <p>SFR QUASAV: Federative Research Structure for Plant Quality and Health.</p> <p>SNES: GEVES National Seed Testing Station</p> <p>SNP: Single Nucleotide Polymorphism</p> <p>SOC: French Official Service for Control and Certification of Seeds and Plants</p> <p>SPAD: Seeds and Plants for Sustainable Agriculture</p> <p>SRAL: Regional Food Service</p> <p>SSR: Simple Sequence Repeat</p> <p>T</p> <p>TIRPAA: See ITPGRFA</p> <p>TWA: UPOV working group for agricultural plants</p> <p>TWC: UPOV working group for computer programs and statistics</p> <p>TWF: UPOV working group for fruit plants</p> <p>TWO: UPOV working group for ornamental plants</p> <p>TWV: UPOV working group for vegetable plants</p> <p>U</p> <p>UPOV: International Union for the Protection of New Varieties of Plants</p> <p>URGI: INRAE Genomics Research Unit</p> <p>UFS: French union for seed companies & plant breeders</p> <p>UMR: Mixed Research Unit</p> <p>UMT Capte: Mixed Technology Sensors and Remote Sensing Unit</p> <p>V</p> <p>VATE: See VCUS</p> <p>VCUS: Value for Cultivation, Use and Sustainability</p> <p>W</p> <p>WYE: Work Year Equivalent</p>
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