



Seed expertise

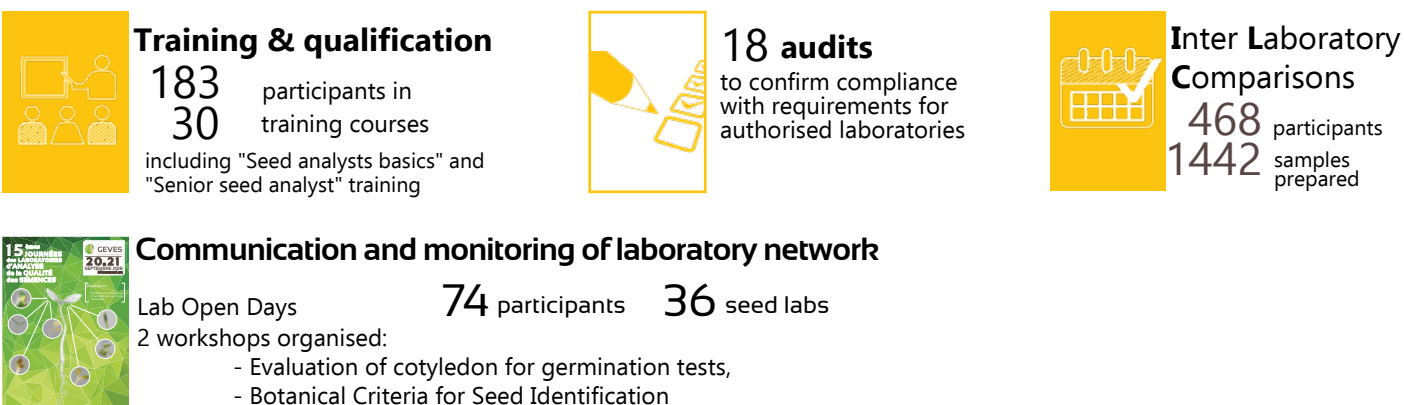
- **NRL (National Reference Laboratory for Seeds and Seedlings) :**
 - Reference methods
 - Laboratory monitoring
 - Official seed quality testing
- **2018 highlights and perspectives**

NRL: Reference methods, laboratory monitoring, official seed quality testing

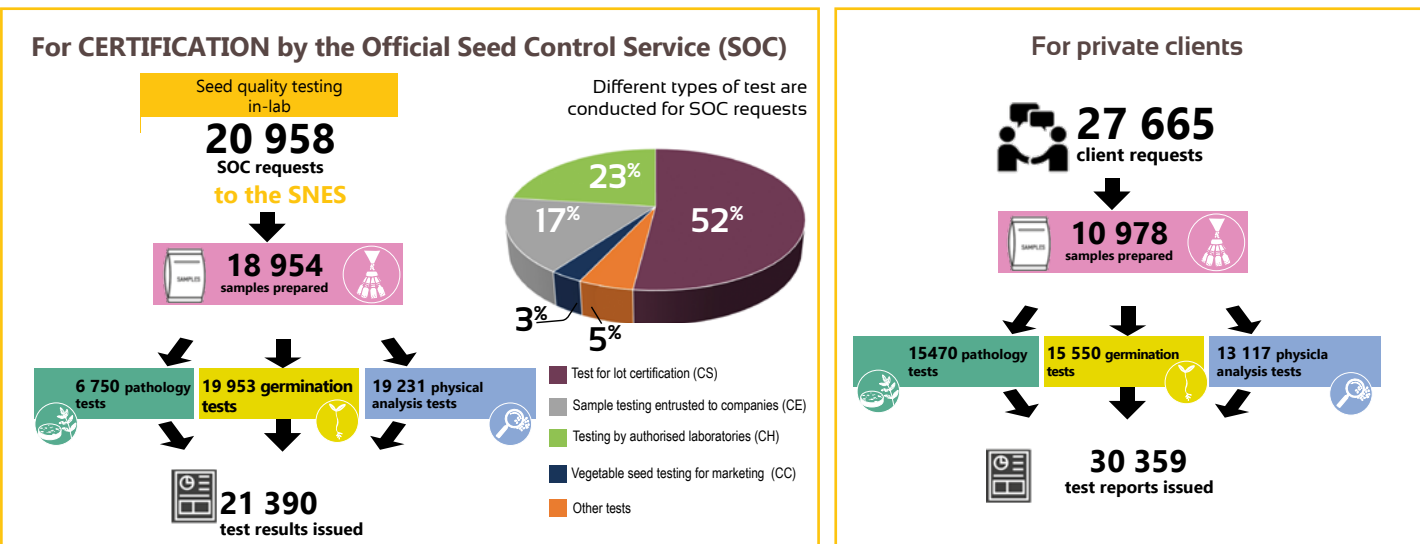
GEVES's National Seed Testing Station (SNES) is **NRL** (National Reference Laboratory) for seed certification. As NRL, the SNES conducts methodological developments, for example to address biological problems in order to test new species, or to bring laboratory testing closer to the field reality. In cooperation with the SOC, SNES provides technical support to authorised laboratories (~ 80 laboratories).

Training and qualification, ILCs and audits are at the core of this mission. The NRL plays a key role in the French seed sector (the leading seed producer in Europe and the world's largest seed exporter).

Technical support for laboratories for seed certification



Tests carried out



Development, validation & formalisation of test methods

For testing new species

SNES laboratories actively participated in ISTA work and contributed to defining ISTA methods for testing the seed quality of new species in seed production. The SNES germination laboratory actively participated in the methodological tests for *Eustoma exaltatum* (a species similar to Lisianthus), *Felicia heterophylla* (Marguerite du Cap) and *Salvia hispanica* (Chia).

As part of the ISTA Moisture Committee, the Laboratory of Physical Analysis participated in developing a method for determining the moisture content for *Carica papaya*.

To address problems of optimum development of seedlings

In germination, it is sometimes found that methods have limitations that lead to a lower result than the maximum potential expected in the case of germination capacity tests (GC).

These limitations are observed because a new treatment product is applied which causes defects of development of seedlings. This is the case for aubergine. The laboratory set up a testing programme to remedy this. The use of pleated blotter instead of flat blotter improves seedling development.

Where it exists, seed dormancy should be removed by the GC method. The SNES has carried out testing that has led to validation by ISTA that the 20-30°C method is the most suitable for breaking radish seed dormancy.

Until now, only sand was authorised as the substrate of first choice to test GC for beans and soybeans, whereas testing in soil was only possible as a second option. As results are systematically better in soil, both tests are routinely conducted in parallel. The work carried out in the laboratory made it possible to change the ISTA rules to allow the soil to be a first-choice substrate. In concrete terms, this now makes it possible to carry out only one analysis instead of two.

To harmonise international practices

ISTA inter laboratory comparison tests revealed heterogeneity in the evaluation of spinach seedlings. This heterogeneity can lead to a difference in treatment of lots according to the laboratory carrying out the analysis, and therefore a different result. The work carried out by the laboratory with ISTA made it possible to clarify and harmonise the evaluation of seedlings.

Improving methods on criteria of economic performance and/or health and safety of analysts

The use of the roller blotter has been very successful, both for saving room (at the SNES, it has reduced the space taken by tests in climate chambers by almost 9) and for lighter handling. In addition to these benefits, method validation work for each species is necessary: the new method must be equivalent to the former method, so that the result produced is equivalent to the result of the original test. Many tests have been conducted in this manner for maize in 2018.

A nematode detection test coupled with a viability check was developed by the SNES and BioGEVES teams (*Ditylenchus dipsaci* on alfalfa) as part of the Dityluz research project.

Progress on the prediction of field behaviour from laboratory tests

Work is currently being carried out in the laboratory in order to predict field emergence for beet seed.

Integrating new technologies for performing analyses

The physical analysis laboratory has begun using pre-screening tests for optical seed sorting. The objective is to obtain two fractions: a fraction of pure seeds whose identification is safe and a fraction of seeds of other species to be confirmed or a "questionable fraction". This last fraction would be the only one to be analysed by expert analysts, providing a significant gain in analysis time.

Digital Tools

The I.D.SEED® database, a seed identification tool, has been expanded and currently references 791 species for a total of 1,071 published records. The English translation of these sheets is in progress.

New training tools

Training analysts of authorised laboratories is an essential part of laboratory recognition. The SNES has set up an e-learning platform in addition to its regular training courses. This first e-learning course made available is the basic training for seed analysts. Prior to the training course, participants can consult modules on sampling, germination, physical analysis and seed health.

Highlights 2018

Activities were globally increasing in 2018, compared to 2017 which was already an exceptional year. The main areas that have changed in 2018 are the laboratory's regulatory missions and their implementation, support activities for the sector, representation and promotion of international expertise, research programs, the extension and development of laboratories to accommodate the increase in activity.

Regulatory missions:

As NRL for seed certification, the SNES has analysed and structured its activities to optimise its NRL mission: organising ILCs, proposing methods to the Ministry of Agriculture and Food (MAA) for formalisation, audits, regulatory surveillance. At the same time, the SNES contributed to revising the SOC/GNIS agreement for all activities carried out for the competent certification authority (SOC). The quantitative and qualitative aspects of performing tests, ILCs, audits and qualification of laboratory analysts of authorised seed companies were determined and validated for three years.

- The SNES teams contributed to DUS and VCUS variety testing, conducting varietal resistance tests, ploidy tests and germplasm quality testing for seed varieties undergoing SEV evaluation. Several methods for analysing varietal resistance have been developed or optimised.
- As part of developments in EU regulations on plant health, SNES participated in reflections conducted by the MAA on the distribution and optimisation of NRL missions between LSV-ANSES and GEVES. Current developments will expand GEVES's missions.

Seed sector support missions:

This includes custom test requests, method development (R&D) requested by companies (e.g. pathogen detection methods, seed tomography, biostimulant and biocontrol efficacy tests, validation of automatic samplers). This activity is experiencing continued growth.

In particular, a new e-learning platform has been created with training modules to prepare for the "Seed analyst basics" training.

International activities:

GEVES has collaborated with several major organisations for its seed activities. The GEVES member nominated by the Ministry of Agriculture and elected to the ISTA Executive Committee actively contributes to the governance of ISTA. The GEVES teams are members of many strategic technical committees, communicating on GEVES's activities and promoting the methodological progress at GEVES. The SNES participates in the standardisation of seed quality testing methods (ISTA, IIRB, ISHI), and in varietal resistance evaluation protocols with the SEV, CPVO, and ISF-DRT. For example, the SNES will present 4 papers and two posters at the symposium of the 32nd ISTA Congress in June 2019 in Hyderabad.

Development of research activities:

- **Innovate and explore new areas and gain new knowledge on seed quality.** GEVES joined the Biocontrol Consortium, and clarified the regulatory areas where GEVES's seed expertise could be enhanced. The germination and pathology laboratories have developed methods for analysing the efficacy of products in response to requests from manufacturers. Serial analyses planned for the AKER Future Investment Project have begun, providing useful information for genetic progress on beet. Several projects began in 2018 on seed health (varietal resistance, detection of pathogens), physiological quality, and seed identification; they are presented in the research chapter.
- **Develop new methods and tools for seed quality testing, and pathosystem analysis for varietal disease resistance studies.** Some examples: RX-3D tomography has been extended to new species. Seed phenotyping has progressed with root elongation measurements. Multispectral phenotyping methods have been explored with the University of Angers and the IMORPHEN unit of the IRHS (INRA-Angers). Studies carried out within the ISTA framework (Seed Science Advisory Group (SSAG)) show a strong correlation between germination at 48 hours and germination in several tested species such as oilseed rape and vegetable species. The 48-hour germination test is automated at SNES. GEVES will explore automating and replacing germination (certification) testing for some species with considerable time savings.
- **Increase productivity and security for analysts.** For daily testing activities, the laboratories validate equipment to put in production to increase the reliability of tests, and facilitate manipulations. An optomachine model for calculating the thousand seed mass and facilitating sampling has been validated in pathology; a second machine is being validated for the other laboratories.

Laboratory extension project:

The pathology laboratory extension project got underway in 2018. Construction has begun for the laboratory extensions and a greenhouse for seed health activities. Building works will allow for the facilities to be operational in 2019. This will make it possible to accommodate the increases in activity and to integrate additional missions that will be allocated to GEVES by the Ministry of Agriculture as part of changes in the EU Regulation on plant health.

The sampling, physical analysis and germination laboratories, as well as the maintenance department, have significantly contributed to the development of prototype benchtop equipment. This equipment is designed to improve the ergonomics of workstations, protect operators against dust and fumes from treatment products and seed dust, and improve productivity. Works will be carried out in stages to ensure continuity of service, starting in spring 2020.

Perspectives 2019

Several areas of GEVES's NRL missions will be further developed:

- Structure the implementation of the EU "Plant Health" Regulation with the Ministry of Agriculture and in close collaboration with the LSV ANSES; organisation of the implementation of GEVES's NRL activities according to books VI (Seeds and plants), and Book II (Plant Health) of the Rural Code;
- Continued innovation and proposal of new methods to be validated at international level;
- Contribute to the formalisation of methods by the Ministry of Agriculture for seed certification;
- Set up the monitoring framework for approved laboratories;
- Develop digital tools for NRL missions (E-training for "blended training", E-testing).

Sector support activities:

- Review the balance between regulatory missions and support needs expressed by the seed sector. Contribute to the new partnership agreement between GEVES and GNIS / SOC which will be finalised in 2019. Within the framework of this convention, GEVES and SOC will examine the sample flow management in order to guarantee high-quality and timely testing services.
- Finalise the partnership agreement between GEVES and ASFIS for training.
- Pursue the development of two main fields: phenotyping and seed health (detection, varietal resistance in the laboratory and in the field).
- Explore new technologies in the following areas:
 - digital tools for training and expertise for company laboratories and the seed sector in general.
 - evaluation of the effectiveness of Biocontrol and Biostimulation products.
 - management of reference material (varieties, seeds, microorganism strains);
 - development and adaptation of IT tools and organisation of interfaces with customers (CRM, LIMS and customer services management).

