GenRes Bridge
Genetic resources for food-secure and forested Europe

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Report of the Peer Review of the Dutch national Genebank at CGN

September 15th to 16th 2021, Wageningen, The Netherlands

Introduction

The Convention on Biological Diversity and UN 2030 Agenda recognized the importance of the *ex situ* conservation of genetic material in genebanks. The Sustainable Development Goal 2 (Zero Hunger) and more specifically indicator 2.5.1 (b) are devoted to the material stored in the genebanks. Many breeds in European countries have either no or insufficient material stored in the genebanks (Leroy et al., 2020). For that, *ex situ in vitro* programmes should be established, implemented, or strengthened to initiate or expand collections for all breeds, especially local breeds *at risk*.

Genebanks are critical facilities, therefore development and implementation of quality management systems for genebanks is very important, as well as research to develop, standardize and implement reproductive technologies and cryopreservation procedures. The research should contribute to the effectivity and efficiency of the genebank operations.

Exchanging knowledge and experiences, improving access to information about genebank collections, and facilitating the exchange of genetic material in Europe, is the main aim of European Genebank Network for Animal Genetic Resources (EUGENA), the European Genebank Network, governed by the European Regional Focal Point (ERFP).

Results of the Innovative Management of Animal Genetic Resources (IMAGE) project have also shown that there is room for improvement in terms of optimizing the cost of *ex situ* conservation in Europe by taking advantage of collaboration between genebanks to increase effectiveness, both within and across countries. The exchange of genetic material and data between collections and countries should become a more common practice in the future. To streamline the conservation activities in Europe over different domains (plant, animal and forest) ERFP cooperates in the EU Horizon 2020 GenRes Bridge project[1].

In the framework of ERFP and with the support of Genres Bridge, a system of peer reviews has been set up aiming at improving the quality of European genebanks by simply having the experts of these genebanks visit each other in their genebanks, giving full transparency about the facilities and protocols, and having discussions about these.

A pilot of these genebank peer reviews is being organised in the second half of 2021, involving the French national Cryobank at Institut de l'Elevage and French National Laboratory for Health Control of Breeding Animals (Paris, France), the Dutch national genebank at Centre for Genetic Resources, the Netherlands at Wageningen University & Research (Wageningen, the Netherlands) and the Slovenian genebank at University of Ljubljana, Biotechnical Faculty (Ljubljana, Slovenia) focussing on the animal genetic resources (AnGR) collections.

Organisation of the review

The review was organised by the team of Centre for Genetic Resources, the Netherlands (CGN) at

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Wageningen University & Research (WUR): Mira Schoon, Marjolein Neuteboom and Sipke Joost Hiemstra. The organised meeting rooms, on-site transportation, and everything else to make the review run optimally.

The review took place on Wednesday 15th of September and Thursday 16th by Delphine Duclos (Institut de l'Elevage, manager of the French national genebank) and the genebank manager Danijela Bojkovski (National genebank of Slovenia, Ljubljana).

During these days, the evaluators visited the genebank facilities, listened to presentations and exchange with CGN staff, and visited a native breeds farm that regularly used genetic material from the CGN genebank. At the end of the visit on Thursday morning, the reviewers presented and discussed their first impressions with the hosts (Mira Schoon, Marjolein Neuteboom) and the director of CGN (Sipke Joost Hiemstra).

Observations, conclusions and recommendations

Organisation

The Centre for Genetic Resources, the Netherlands (CGN) is part of Wageningen University & Research. CGN carries out statutory research tasks on behalf of the Dutch Ministry for Agriculture, Nature and Food Quality (LNV) related to the conservation of genetic diversity of livestock species and breeds (animal genetic resources) that are important for agriculture for long-term conservation.

Livestock species include cattle, pig, horse, sheep, goat, chicken, dog, duck, goose, pigeon and rabbit. Cattle, pig, horse, sheep, goat and chicken are the most important livestock species for the Netherlands. Recently, the Ministry of Agriculture (Dutch Ministry) decided to extend the scope with aquatic genetic resources.

CGN operates financially on the basis of 5-year programmes. Statutory tasks are financed by the Ministry LNV, and also includes some basic/strategic research. CGN-AnGR also participates in additional projects, funded by the EU, companies, etc.

Establishment and maintenance of genebank collections is the major part of the AnGR programme of CGN. In total six to eight part time staff is working for CGN-AnGR. Other tasks of CGN, next to or parallel to genebank related activities, are policy advise and supporting breed societies to implement sustainable breeding programs.

Agreements with WUR enables CGN to use all available technologies and facilities (e.g. genebank lab, genebank storage, equipment, offices).

Observation 1: Embedding of CGN within WUR is a complex structure, however in this structure CGN can make optimal use of the infrastructure of human resources of WUR and also students can be easily involved.

Policy Development

CGN and its director Sipke Joost Hiemstra has a significant role in the international and European arena of Animal Genetic Resources. He is involved in the various debates on the policy and strategy as well as valuable member and present chair of ERFP.

No specific national law on genetic resources is in place, only a genetic resources policy document "The Source of existence" was written in 2002. The international obligations CBD, FAO GPA, Nagoya Protocol,

SDG's, EU policies and legislation are the basis for the CGN mandate and commissioning of the programme to CGN by the Dutch Ministry of Agriculture, Nature and Food Quality.

Recommendation 1: Establishment of a national law or clear mentioning of the role of CGN and its genebanks in national policies could strengthen the position of CGN and its role.

CGN Quality Management System

CGN has implemented a Quality Management System (QMS) according to NEN-EN-ISO9001:2015 and most of its activities have been certified. This requires annual external and internal audits.

CGN's experience is that the introduction of a quality management system leads to a significant improvement in the quality and efficiency of its work. Procedures are discussed and periodically improved when needed. During the implementation of the quality management system, CGN has identified several critical processes without adequate protocols, which have been discussed and provided with solutions. In addition, a quality management system makes it easier to introduce protocols and procedures to staff or to inform (new) colleagues and guests about procedures.

The CGN Quality Manual includes sections on management, organization, personnel, and ways to analyse and improve genebank procedures. A clear risk assessment is also used to identify the major risks and try to plan actions to prevent them. All these documents are included in a specific software: iCOLOGIC.

The Quality Manual also describes the actual technical procedures. The manual contains detailed information about all the activities within the animal genebank, about MAA and MTA documentation and storage procedures (ordering, testing, storing, access, distribution, etc.).

Recommendation 2: Guidelines and procedures on sampling, storage and management have been established for each species for different steps. English versions would be very useful for other genebanks and in case of foreign employees. There is a lot of documents in the information system iCOLOGIQ, which can be difficult to find for new staff. Meta information of all procedures and links to the specific documents would be beneficial.

Storage of the material

Reliable cryo-conservation methods and protocols are essential to ensure the quality of genebank material. CGN has developed and continues to improve methods for cryo-conservation of sperm, embryos, oocytes, ovarian tissue or primordial germ cells from various animal species. The entire collection is stored under optimal long-term storage conditions in liquid nitrogen at -196°C.

The core collection contains all Dutch livestock breeds, with a focus on the conservation of native breeds, especially endangered native breeds. A sufficient number of donor animals and a sufficient amount of genetic material to allow the recovery of a population is the main objective of a core collection. CGN has developed a calculation programme that calculates for each species how much sperm and/or how many embryos should be stored per breed and per donor animal. Much attention is paid to careful selection of donor animals to ensure genetic diversity within a breed. To achieve this, they work with breed associations and specific breeders.

In addition to livestock species, the mandate of the CGN has recently been expanded to include the establishment of reserve collections for aquatic species used in aquaculture.

In case of unexpected events, a duplicate of the collection is kept in another location (mirror site) at the Veterinary Faculty in Utrecht to protect the collection. This second collection site is already quite full, therefore not the entire collection is stored at the mirror site, which poses a high risk to the stored material at the main storage site.

Recommendation 3: The mirror storage facility should be increased as the place is now insufficient. Alternative options should be explored as soon as possible, including the potential future possibility to exchange duplicate collections between (neighboring) countries.

Collection Management

The CGN collections are managed by a project leader who is responsible for all activities related to the animal genebank and cryoconservation related projects. CGN has a dedicated expert for the collection and storage of the material. Depending on the situation and the type of animal, material is also acquired from other parties, e.g. AI-centres. The donor animals are tested for certain diseases before and, if necessary, after the collection of the material.

All protocols and procedures for collection and storage are in place: acceptance criteria, various tests, quality standards before and after freezing, etc.

The specific derogation from the ministry authorizing the CGN to collect bull semen of breeds at risk is very useful, even if regular collection at AI centres should be privileged.

Access and Distribution

The stored material can only be used for breeding and research purposes. The information about the material stored in the AnGR genebank and the visibility of the material is excellent and available on the website www.genebankdata.cgn.wur.nl. Here the animal ID can be found and for further information the CGN staff can be contacted.

The decision on what to store and what can be used is made by the genebank project leader and head of CGN-AnGR. They also consult with experts and breeding organizations. They have also established general criteria that must be met in order to issue the stored material. The same is done for all species.

Recommendation 4: It would be useful to clarify on the website the real possibilities to use each material, based on number of doses and quality. The idea of a color code (green: available, orange: available with some precautions, red: only for very specific projects) seems good and should be implemented.

Documentation

The current Cryoweb documentation system is outdated and not very user friendly. The database is still functional, but a new information system is planned as part of the new 5-year programme. The new database should allow linking and updating between different databases. In another database www.genebankdata.cgn.wur.nl information is available on the stored material per species and per breed, but not on the type of stored material stored and the quality.

Recommendation 5: Development and implementation of a new modern database is essential. The new tools developed should allow interoperability and data optimization between different databases.

Final conclusion

The CGN Animal Genetic Resources genebank is well organized with dedicated and well trained staff and excellent facilities to conserve the valuable AnGR collection. There is good collaboration with breeding organizations and various stakeholders as well as researchers. Space constraints for the mirror site are due to be addressed in the near future, so further investment in facilities is required. A communication strategy for both the general public and breeders should be further developed. Development of a modern database infrastructure with tools and user interfaces is planned in the next five years.

Final remarks

The reviewers appreciated the transparency and sharing of expertise, procedures and information given by the hosts during the review. The discussion was extremely useful for the genebanks, which are not as developed as they were at CGN. The hospitality of the hosts, the positive atmosphere and the richness of exchanges suggest that reviews such as this would help other genebanks to develop and adopt similar quality standards.

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