Towards Uniform Gene Bank Documentation In Europe – The Experience From The EFABISnet Project

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Introduction

With the Interlaken Declaration and Global Plan of Action for Animal Genetic Resources in 2007, countries have recognized the need for improvement in monitoring, conserving and documenting animal genetic resources. Several projects have been set-up in Europe to address these issues. In the EFABIS project (Rosati *et al.* 2006), with the cooperation of the European Union (EU), two major databases on domestic animal data, those of the Food and Agriculture Organization of the United Nations (FAO) and of the European Association for Animal Production (EAAP), were merged. A software for the establishment of information systems for animal genetic resources at the national (Groeneveld *et al.* 2006) and at the regional level was developed, allowing national systems to be also used as data collectors for the world Domestic Animal Diversity Information System (DAD-IS) at FAO. A protocol (Duchev and Groeneveld 2006) for automated data exchange was developed to facilitate data sharing among countries and regions as indicated in the Strategic Priority Area1 (Characterization, Inventory and Monitoring of Trends and Associated Risks) of the Global Plan of Action.

In the follow-up EFABISnet project, a collaborative effort of EAAP, FAO and partners from 14 European countries, in cooperation with the European Regional Focal Point for Animal Genetic Resources (ERFP), national information systems for monitoring the animal genetic resources on breed level were established in Austria, Cyprus, Estonia, Georgia, Iceland, Ireland, Italy, Netherlands, Slovakia, Slovenia, Switzerland, and United Kingdom. The network was soon extended beyond the project plans, with the establishment of EFABIS

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databases in Finland, Greece, and Hungary. The network was then complemented by a set of inventories of national gene bank collections to strengthen the documentation of *ex situ* conservation programmes. These documentation systems were established by the National Focal Points for management of farm animal genetic resources. Here we present the experience gained in establishment of these national inventories of gene banks and their relevance to the Strategic Priority Areas of the Global Plan of Action which could be useful for other areas in the world.

The situation at the beginning of the project

At the beginning of the EFABISnet project there were several countries in Europe which had already established national cryo-reserves and respective information systems. These include inter alia the Dutch Gene Bank established in 1993 (Groeneveld *et al.* 2004) and French gene bank established in 1999 (Danchin-Burge *et al.* 2006). In all of the project partner countries, except Georgia, collections of cryo-preserved material were already in place. In Georgia such collection is expected to start in 2010. Most of these collections had by that time the status of national reserve, or they were in the process of receiving such status.
National gene bank collections cover the main livestock species in Austria, Slovenia and Netherlands, the latter being the country with broadest coverage. Two countries included dogs in their collections, one country also chicken. As shown in Table 1, in many cases a single type of material is conserved per species, most often semen, followed by blood.

Most countries have stored data about their collections in electronic form, one exception being Iceland where information is still mainly kept on paper. There are large differences among countries regarding collection size. The national cryo reserves of Netherlands and Austria are the largest ones, contain more than 100,000 doses of semen each. The collection of Slovenia is among those with a medium size, those of Estonia and Slovakia are rather small.

Table 1: Species and material stored in (national) gene bank collections, by country.

Countries	Cattle	Horse	Sheep	Goat	Pig	Poultry	Others
Austria	Semen Embryos	Semen DNA	Semen DNA	Semen DNA	Semen DNA		
Estonia	Semen Embryos						
Finland	Semen Embryos	Semen	Semen				
Iceland	Semen		Semen				
Netherlands	Semen Embryos	Semen	Semen	Semen	Semen	Semen	Semen
Slovakia	Semen		Semen				
Slovenia	Semen Blood DNA	Blood DNA	Semen Blood	Blood	Tissue		Blood
Switzerland	Semen			Semen			

The documentation software

The CryoWEB software. As mentioned in the ERFP Guidelines for the constitution of national conservation programmes (Hiemstra 2003), a consistent documentation system should be an integral part of gene bank management. For this project, a uniform and Open Source solution was required as it had to be applicable to heterogeneous situations in different countries. It should be able to work "out-of-the-box" for any species and material types already present in the collections, or which could be added in the future. On the other hand, countries should have the freedom to customize the software without the constraints of a copyright holder. As access to national information is not always public, the software had to have also means for restriction on the information visible to users.

We used the CryoWEB software (http://cryoweb.tzv.fal.de/), developed at the Institute of Farm Animal Genetics, FLI (Mariensee, Germany) on the basis of the ideas and software used for the Dutch Gene Bank (Groeneveld *et al.* 2004). CryoWEB was implemented in the EFABISnet project to fully meet the project requirements. The software stores information for each sample in the collection, its donor, location in the storage facilities, movement among facilities and usage. It requires from the user only a minimal set of data, which is essential for the bookkeeping of a national gene bank.

Data collection for EFABIS. In addition to the DAD-IS breed core data, the European regional database EFABIS stores general information on the cryo-preserved genetic material in each country. Data are collected per breed on a yearly basis and include number of semen straws, embryos, oocytes, male and female somatic cells. In this regard, the CryoWEB system can be used as a data collector for EFABIS. The system has the option to export on a yearly basis cumulative statistics of the conserved material per breed and material type in a file format which allows direct upload to the EFABIS database. Thus, countries can easily exchange data to generate statistics on sub-regional and regional levels.

Discussion

Several issues were raised during the set-up of the CryoWEB software in the different countries, which, because the generality of their character, should be taken into account when establishing a gene bank documentation system elsewhere.

Collecting all required data. In most of the countries even the minimum required data set was not readily available, or even was not available at all in the organization where the information system was installed. Often, other organizations had to be contacted for completing the minimum dataset. In the cases of old samples some of the data required from CryoWEB was not available at all. In such cases the manager of the national gene bank has to take a decision what values to be used for missing data items. In all these cases the built-in rules of CryoWEB enforce documentation discipline and consistency, thereby assisting the management of the national collection in identifying possible gaps in their former data archives.

Loading of existing data. Three cases can be distinguished depending on the amount and the form in which data is stored. In countries like Iceland, where gene bank documentation is

stored on paper, the only choice is manual data entry. This requires some investment in human resources, proportional to the amount of data to be entered. In the case of Iceland, due to lack of resources, no data has been entered thus far. In other countries, the data was available in electronic form, but in a format which does not allow automated extraction (e.g. MS Word documents), so data also had to be entered manually, as was done in Estonia. In countries which had already data stored in some databases, or formats allowing exports, the migration was performed on an individual country by country basis. This implied writing software for exporting the data from the old database and for importing in CryoWEB. This was done for the Netherlands, and partially for Austria, Slovenia, and Switzerland.

Data validation and cleaning. Even data exported from the Dutch database contained some inconsistencies, which had to be cleaned manually. This process required repeated runs of data set loading, and fixing after each cycle the errors reported by the system. In particular the information on storage location of the material might be incomplete and furthermore requires validation, especially for the case of very old material. In this case, checking of the actual storage location of each sample might have to be done by searching the cryogenic containers.

Conclusion

This was the first attempt in Europe to define and harmonize the documentation of national gene bank collections. Using software such as CryoWEB, countries can quickly build an inventory of uniform data. Thus, the same data set will be available across species in all countries and can easily be exchanged at both regional and international levels. Within the EFABISnet project a group of users from 13 European countries were trained, and this group is expected to further disseminate the experience gained. This process will strengthen gene banks information systems and will facilitate the establishment of new systems in countries. A logical continuation will be the setup of CryoWEB in other countries outside EFABISnet project and the establishment of a regional gene bank information system to facilitate data exchange in new networks.

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