

SPEAKING TO PAN EUROPEAN NETWORKS, SIPKE JOOST HIEMSTRA AND DANIJELA BOJKOVSKI DISCUSS THE CHALLENGES AND OPPORTUNITIES INVOLVED IN CONSERVING ANIMAL GENETIC RESOURCES

# Livestock diversity

**T**he term animal genetic resources (AnGR) is often used to refer specifically to the genetic resources of avian and mammalian species used in or potentially used for food and agriculture purposes (as defined by the UN Food and Agriculture Organization (FAO)), or as 'all animal species, breeds and strains that are of economic, scientific and cultural interest to humankind in terms of food and agricultural production for the present or the future' (as defined by the International Livestock Research Institute). According to the FAO's Second Global Assessment of Animal Genetic Resources in 2015, some 8,800 different breeds within 38 animal species can be considered under this category, the main ones being livestock such as cattle, sheep and pigs. Genetic diversity, both within and between breeds and species, is important to produce nutritious food and to achieve global food and nutrition security. Breeding is impossible without genetic diversity, and genetic diversity is essential in terms of responding to new diseases, creating more sustainable production systems, meeting new consumer preferences and combatting the effects of climate change.

But the Earth's genetic diversity remains at risk, and the management and conservation of AnGR are in desperate need of improvement if the long-term diversity and use of animal genetic resources are to be ensured. A better understanding of the different types of AnGR and the systems in which they are kept, as well as a greater focus on breeding and conservation programmes, is as such urgently required.

Pan European Networks spoke to the chair of the European Network of National Co-ordinators, the European Regional Focal Point for Animal Genetic Resources (ERFP), Sipke Joost Hiemstra, and the head of the ERFP Secretariat, Danijela Bojkovski, to find out more.



Sipke Joost Hiemstra



Danijela Bojkovski

## What are the main challenges that need to be overcome to ensure the long-term and sustainable use and development of animal genetic resources?

There is a long list of challenges to overcome – among them, improving the profitability and added value of a diversity of breeds, maintaining the interest of a new generation of farmers, developing efficient and society-relevant farming systems, and promoting interest in long-term values, not just short-term profits.

A specific challenge is general market failure. Currently, the price of food does not reflect the full costs and benefits associated with different farming systems. At the moment, the market operates rather simply: the main incentive for farmers is to increase productivity, but what that often doesn't take into account is any environmental or alternative value that a livestock breed supplies, and negative externalities of production systems are taken into account only to a limited extent. Certain breeds provide – directly or indirectly – different ecosystem services, for instance the maintenance of specific landscapes and Nature values (through grazing), and that kind of value isn't always paid for.

**Some 8,800 different breeds within 38 animal species can be considered under the category of animal genetic resources, among them the Drežnica goat**

Moreover, livestock is particularly relevant for utilising and adding value to (lower quality) feed resources that cannot be used for human consumption directly. Not all breeds are similarly suited for this purpose. The valuation of all ecosystem services and a recognition of the many different roles and values of livestock species and breeds are therefore important, as is the fair comparison of market and non-market values.

In a similar vein, many breeds are associated with niche products such as special cheeses or meats. Those products have a special value which must be paid for, but it is not always

easy to maintain those high-value product market chains and to develop profitable (short) supply chains.

New technologies represent another key challenge or, rather, an opportunity. The more we know about genetic diversity at the DNA level, the better we can exploit what we have in breeding programmes. In other words, a greater knowledge of what we actually have will benefit breeding companies or breeders in the long run. Genomics developments offer a lot in terms of better understanding the genetic background of traits; by using that knowledge, for instance, we can develop very specific breeds or products, or better maintain the diversity in a population.

Of course, not every farmer or livestock keeper has access to this knowledge or to those technologies, so exploiting this might contribute further towards the general trend of large-scale supply chains and specialisation in the sector – which could be seen, then, as a conflict between the interests of the livestock keepers on the one hand and the professional breeding industry on the other, but we think it should go hand in hand. If you take the different values of animal genetic resources – whether production-related, environmental, or in terms of specific products – there is something to gain for all different types of stakeholders, including both the specialised breeding industry and the farmers/livestock keepers.

### **How is that trend towards specialisation impacting on the role of the farmer as keeper of animal genetic diversity?**

The major global trend is still towards specialisation and the horizontal/vertical integration of large-scale supply chains. Genetics and breeding is, or should be, fully integrated supplying breeding material for those supply chains. A small number of specialised breeds and 'products' are dominant in the livestock sector, and farmers increasingly become 'users' of genetic material to produce end products.

On the other hand, there is a diversity of production systems and agro-ecosystems that do not fit with the main trend of large-scale, industrialised agriculture. Together with the long-term responsibility of governments (in particular, *ex situ* back-up) and the short- or medium-term

### **European Regional Focal Point for Animal Genetic Resources**

The ERF is the regional platform to support the *in situ* and *ex situ* conservation and sustainable use of animal genetic resources, to assist and enhance the national co-ordinators' activities at the European level, and to facilitate the implementation of the FAO's Global Plan of Action for Animal Genetic Resources in Europe.

Other key objectives:

- To develop and maintain regular contact and exchange of relevant information on AnGR – horizontally between European national co-ordinators and the European Federation of Animal Science and vertically with the Global Focal Point in Rome using existing structures;
- To stimulate and co-ordinate the maintenance and further development of national and regional AnGR databases and to encourage European information networking on AnGR (via EFABIS – the European Information System for AnGR); and
- To influence policy development at the EU or global level that will directly or indirectly influence the conservation and sustainable use of AnGR.

While not a lobbying organisation, ERF national co-ordinators have supported and advised on many initiatives at the national and European level, including animal breeding legislation and a preparatory action for genetic resources on behalf of DG Agriculture. The ERF is currently involved in the interpretation and implementation of the EU legislation on access and benefit sharing legislation.

The ERF is an important communication channel for governments and stakeholders in Europe, and possibly the broader public. The results of all activities can be seen at the ERF website.

interest of the breeding industry to maintain genetic diversity within their breeds/lines, (small-scale) farmers will continue to play a pivotal role in maintaining genetic, cultural, and agro-ecosystem diversity.

### **Is there a wider role for animal gene banks to play here?**

Gene banks have a primarily long-term conservation objective and serve as a back-up for live breeding populations. The complementary activity of storage in gene banks is important since it provides insurance for changes in production and market conditions and protects this genetic diversity against threats from diseases, disasters and other catastrophic events.

Gene banks usually have multiple objectives; for example, gene bank material is being used in the breeding programmes of endangered breeds, gene bank collections are an important source of genetic diversity for scientific research purposes, and collections have been used to build a larger reference population for genomic selection of commercial breeds.

In ideal conditions all animal genetic resources should have a collection of cryoconserved germplasm as a back-up, and the importance of the stored material is increasing as the population size of the breed decreases.



When we speak about gene banks we usually speak about the storage of reproductive material in liquid nitrogen, i.e. semen and embryos, which can be used directly in breeding. We could, however, also use the terms 'genetic collection' or 'biobank', which are broader terms encompassing any type of genetic material – from semen and embryos to DNA or tissue – that can be used for breeding but also for research purposes. This latter function is particularly relevant for the scientific research community to better understand the genetic background of certain traits, to understand the genetic differences between breeds, and, in a wider context, to understand why certain breeds with certain genetic backgrounds are in certain agro-ecosystems or production systems and others are not.

**2017 marks ten years since the first publication of The State of the World's Animal Genetic Resources for Food and Agriculture and the adoption of the landmark Global Plan of Action for Animal Genetic Resources. How would you assess the progress made since – both internationally and within Europe?**

If you look back ten years, I think we are making a substantial and important progress. First of all, there is much more awareness of the values of animal genetic resources, about the importance of both *in situ* and *ex situ* conservation measures, and there is increasing interest in society for food diversity and nutritional quality. Networks, including ERF, have become stronger and more active.

On the other hand, it is not so easy to fight against the globalisation trend towards more efficiency and uniformity, which often neglects other/broader values associated with livestock production systems and breeds.

**More widely, what are your main priorities as the European Regional Focal Point for Animal Genetic Resources heading further into 2017?**

Since the ERF was established over 15 years ago, we put a lot of emphasis on better documentation of breeds, on supporting policy development on conservation and a sustainable use of AnGR, and on implementing related strategies. More recently, we have begun to pay greater attention to gene banks. We are now in the process of formally establishing a gene bank network in Europe (EUGENA), which should allow us to better exchange and access information in and between national gene banks. The EU Horizon 2020-funded research project IMAGE supports the development of EUGENA. IMAGE focuses *inter alia*

**The European Regional Focal Point for Animal Genetic Resources**

on the better characterisation and rationalisation of genetic collections, and on promoting the use of gene bank collections. Europe is already home to many different genetic collections of animal genetic resources at national level, but they are somewhat invisible and often don't have a very clear status at national level. EUGENA will hopefully help to change that. Having that professional gene bank network is really important because we need a complementary strategy, i.e. a gene bank strategy, to go hand in hand with the breeders themselves as a back-up for breed populations and genetic resources that might get lost in the long run.

Further to that, the ERF is also now discussing what we as a network should do to better support and facilitate *in situ* conservation at the European and national levels. Although we view *ex situ* and *in situ* conservation as complementary, they are, in terms of ERF support and activities, quite different – determining our exact role in *in situ* conservation will therefore be really important.

Finally, the ERF will also continue working to ensure access to information about breeds and collections at the national and European level. For that, we have a European database (EFABIS) and the global FAO database (DAD-IS). The FAO is currently in the process of modernising the whole database structure to make sure that there is a good connection between DAD-IS/EFABIS and other relevant databases. Besides the important connection with gene bank databases, it would also be interesting to connect to other databases, e.g. on climate or weather conditions or agro-ecosystem characteristics. As we have already mentioned, technology and data are a key opportunity to better understand the diversity of breeds and to make better use of the diversity that we have. That should be a clear area of focus.

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