POLICY BRIEF

Animal Gene Banks: More than just a bank!
A gateway to the future for European livestock populations

***Context*:** One of the most prominent challenge future generations will be facing is the impact of climate change on our daily lives, including food production and quality of our environment. Genetic diversity of farm animals is the resource for further adaptation of livestock. However, selection is decreasing genetic diversity while its success depends on genetic variability for further progress. Preserving genetic diversity in animal gene banks is necessary to keep options for the future of animal breeding and contributes to sustainability of animal farming. Let's prepare our future by acting today.

Problem: Less than 1% of the genetic material in the collections of gene banks is transferred into livestock breeding programs or breed conservation programs in Europe, on a yearly basis.

Reasons behind the problem:

1. The lack of genomic and performance data on resources of gene banks severely limits their transfer into current breeding programmes.
2. The reproductive success of genetic material from gene banks is very variable and some procedures are very costly.
3. Recently developed reproductive biotechnologies facilitating the use of gene banks lack a proper regulatory framework at the national or European level.

IMAGE Solutions:

1. IMAGE initiated a Dialogue Forum for the national animal genetic resources coordinators which resulted in a modification of the **delegate act of the new EU Animal Health law for germplasm to mention specific issues for gene banks.** It is now possible for the national authorities to set up specific measures facilitating exchanges of gene bank material, which would also increase the transfer of genetic materials into breeding schemes.
2. IMAGE researchers have found new approaches to **improve the efficiency of frozen semen in chickens** as well as the **quality of preserved embryos and embryonic cell**s to increase the reproductive success in pigs and chickens. This would enhance the use of gene banks for a broader group of species and significantly speed up the recovery of lost genotypes in these species.
3. IMAGE partners developed the knowledge to **suggest specific regulatory recommendations concerning the reproductive biotechnologies** needed for the use of reproductive collections stored in national gene banks.
4. To improve genomic characterization of gene bank collections, IMAGE has produced **new genotyping and sequencing data** for cattle, sheep, pig and chickens, which enable the identification of selection signatures like adaptation to local environments.
5. IMAGE demonstrated the **value of gene bank collections in various case studies**, comparing genetic diversity in gene banks and live populations, assessing genetic changes over time, and testing the use of gene bank material to develop a new commercial line.
6. **Web portal and breeder's interfaces** developed by IMAGE will facilitate the discovery of gene bank collections and help to connect them with data produced by different EU projects, providing breeders and researchers an easy access to multiple sources of information.

7. The design of **a multi-species SNP chip** has been done to propose a cheap and convenient tool to assess diversity in gene banks and compare it across gene banks as well as to the diversity of live populations, in Europe as well as outside Europe. The IMAGE001 chip will be publicly available with a target price below 20 € for a genotype.
8. In order to help users plan their request of material, a **publicly available software**, MoBPS, has been developed to **optimize a large variety of breeding schemes**. It allows to test scenarios for using gene bank material aiming at decreasing inbreeding level, facilitating the recovery of lost traits, or the re-introduction of specific aptitudes in a selected population.

Policy recommendations:

1. National authorities need to officially recognize national gene banks for conservation purposes and set up specific measures to facilitate the use of gene bank materials.
2. Facilitating the use of gene bank materials should not compromise actions aimed at securing long-term conservation of the genetic diversity in a collection.
3. More cooperation between European gene banks should be supported in order to decrease the overall cost of gene banking for a given number of breeds and to exchange knowledge and protocols between gene banks.
4. Gene bank collections need to be better documented by increasing the available genomic and phenotypic data in order to facilitate their use by breeders.
5. Initiatives for introducing specific traits from genetic collections into commercial breeding programmes should be supported in particular for increasing the adaptation of current livestock populations to different environments and changes in production systems.

Expected societal impact of the policy recommendations

Optimizing the cost of gene banking would allow to increase by 20% the long-term storage capacity for endangered populations or rare genotypes for a given total budget in Europe.

Improving the management of local breeds thanks to gene banks will contribute to maintain human populations and economic activities in predominantly rural territories (= 44% of European Union).

As a result of IMAGE research on specifying genes linked to the adaptive capacity of an animal, livestock in future could be more adapted to environmental conditions caused by climate change and by the transition pushed by agro-ecological principles.

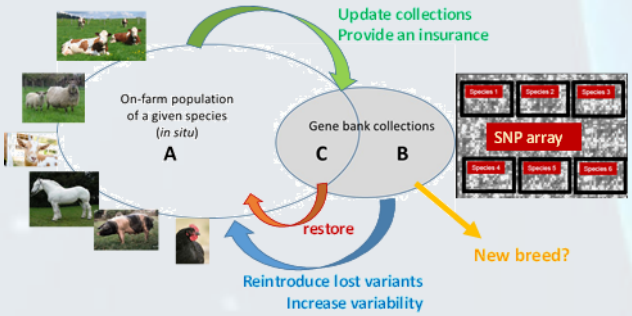

Figure: Single Nucleotide Polymorphisms= markers providing information on the genetic diversity and the genetic potential of a population.

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28 partners: 13 EU countries and 5 non-EU including Switzerland, Argentina, Colombia, Egypt and Morocco
Project duration: 1 March 2016 - 29 February 2020
See also: https://www.animalgeneticresources.net/