



## **A European infrastructure for farmed animal genotype to phenotype research**

### **Deliverable 4.1**

## **List of existing biorepositories to be connected via a common portal for access to resources labs**

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## 1. Executive Summary

<b>Background</b>	EuroFAANG (European Functional Annotation of ANimal Genomes) aims to streamline use of interdisciplinary capabilities for G2P (Genotype to Phenotype) research in terrestrial and aquatic farmed animals and provide transnational access to all of the relevant facilities, expertise and knowledge to European stakeholders. Consolidating biobanking services for cellular models across Europe has been identified as a key component in developing the concept of EuroFAANG Research Infrastructure.
<b>Objectives</b>	To obtain information about existing biobanks in Europe for farmed animal genetic resources and explore their willingness to contribute to a future infrastructure offering access to biobanking services for cellular models NB: in this deliverable we will use 'biobank' instead of 'biorepository' because biobank is the international definition given by the ISO 20387 standard.
<b>Methods</b>	Data were collected through an online survey that was sent to a list of institutions holding or managing a collection of farm animal genetic resources in Europe. The list of institutions and contact details was provided through the network of the former IMAGE consortium (H2020 project) as well as through the EuroFAANG Consortium partners and the European National Coordinators for animal genetic resources in May-June 2023. The survey was organized into two sections: (1) main features of the biobank (2) ability and willingness to contribute to G2P research in farmed animals. Answers from the survey were collected from early May until mid-June 2023.
<b>Results &amp; implications</b>	A total of 29 organizations representing 14 countries completed the questionnaire. For the majority of countries, a single institution per country responded. Spain had the highest number of responding institutions. The answers showed that the majority (69%) of the biobanks can offer a storage service for cellular models to support G2P research in farmed animals, an additional 18% would need additional training or equipment to do it, and only 14% are not interested. The percentage of biobanks ready to amplify or generate stem cells or organoids, respectively, was much smaller (21%, 14% respectively) but a great majority would consider doing it if training and/or equipment can be provided. Thus, a significant number of animal biobanks are ready or interested in contributing to the EuroFAANG research infrastructure project in the future. Those biobanks willing to contribute to a future infrastructure will receive the 2 <sup>nd</sup> part of the survey, dealing with operational aspects, such as information system, quality management, fee policy. In addition, 48% of the biobanks surveyed were involved in a national network, while 52% were not. In several countries (France, Italy and Spain), some collections were part of a national cryobank network for animal genetic resources where partners were sharing information or where some of the biological materials were stored in a common place (France/individual nodes of the CRB Anim project, Spain). Connection with the EUGENA network appeared quite limited at this stage and as such the EuroFAANG research infrastructure project can help with the promotion of the EUGENA initiative, and future consolidation of biobanking efforts across Europe, which would be advantageous for G2P research in farmed animals.

## 2. Introduction

The EuroFAANG (European Functional Annotation of ANimal Genomes) research infrastructure project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No 101094718. EuroFAANG aims to streamline use of interdisciplinary capabilities for G2P (Genotype to Phenotype) research in terrestrial and aquatic farmed animals and provide transnational access to all of the relevant facilities, expertise and knowledge to European stakeholders. One of the first goals (Work Package 4, Task 4.1) was to collect detailed information about the readiness of the European Animal Biobanks to include *in vitro* cellular models in their services to support G2P research. The information gathered through this survey will be made available on the EuroFAANG web pages and be used for further analysis in the EuroFAANG research infrastructure project. This report presents the main results of the survey.

## 3. The Survey

### 3.1. Methodology

Data were collected through an online survey prepared using JotForm survey tool (<https://www.jotform.com/>). The survey was sent to a list of institutions holding or managing a collection of farm animal genetic resources in Europe. The list of institutions and contact details was established in May 2023 after merging the list of biobanks provided through the network of the former IMAGE Consortium (H2020 project), contacts provided by the EuroFAANG Consortium partners and the European National Coordinators for animal genetic resources. (see Annex 2) The survey included two sections: (1) main features of the biobank (2) ability and willingness to contribute to G2P research. It was circulated and answers were collected mid-May and mid-June 2023 respectively (see Annex 1 to this deliverable)

There were two sections in the survey. Section 1 covered general information (contact details of the organization involved, main features of the biobanks such as species, breeds, biological material stored, conditions of access to the resources) and Section 2 covered the specific information pertaining to biobanking services for cellular models. The general questions were prepared using a similar survey designed for the IMAGE project, in which INRAE was a project partner, as a template.

### 3.2. Respondents

A total of 29 organizations representing 14 countries (out of 33 countries that received the survey) returned the survey which is an overall percentage of 42% respondents (Figure 1). The majority of the answers came from a single institution per country. Out of these countries, Spain had the highest institutions (9 organizations) answering the survey as seen in (Figure 2,3)

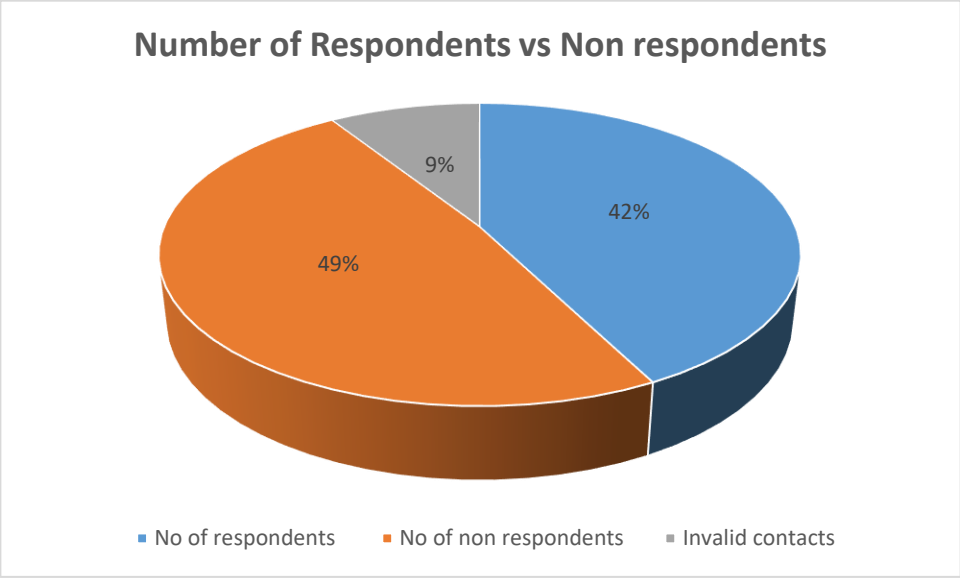


Figure 1: Number of Respondents vs Non respondents by country

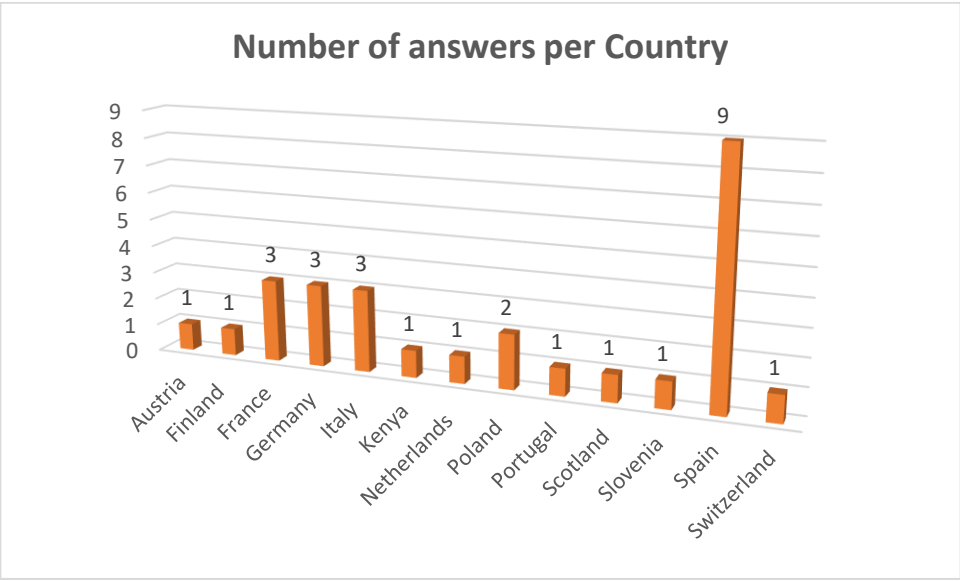
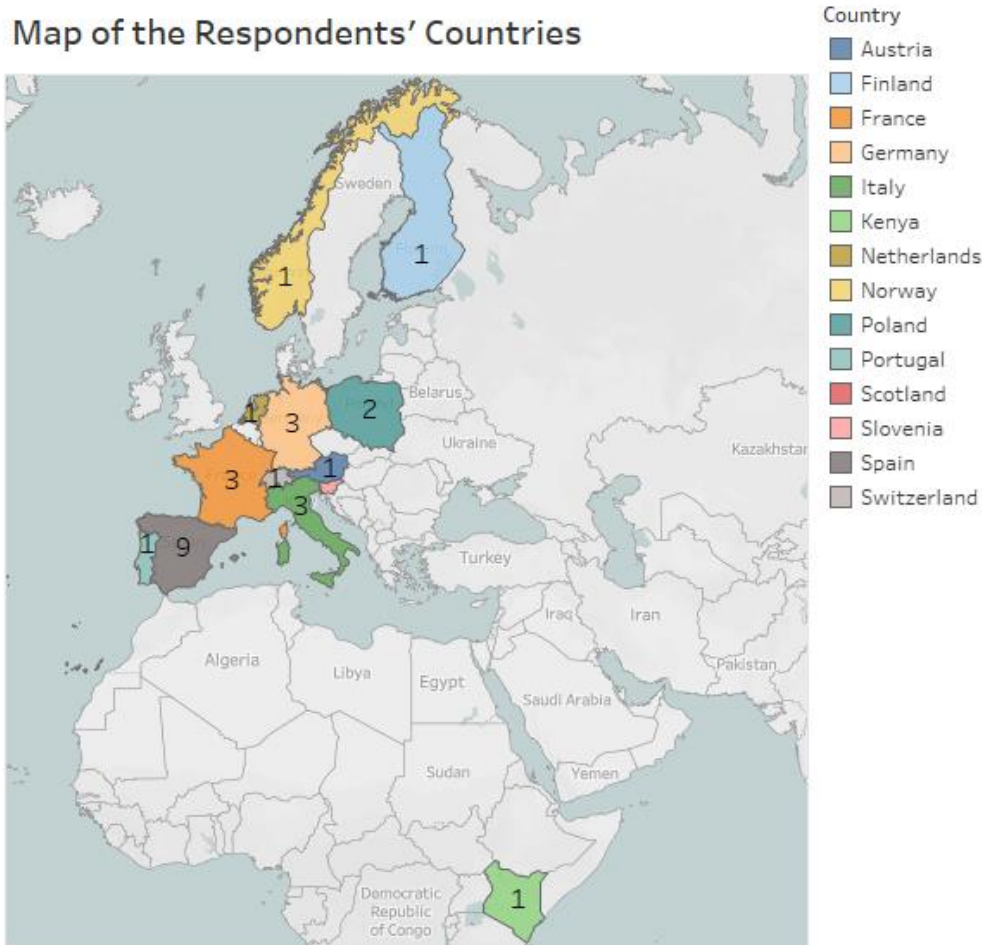


Figure 2: Number of respondents to the survey per country



*Figure 3: Map showing the countries of the respondents to the survey. The biobank from Kenya was actually a dual response from Scotland and Kenya for the CTLGH biobank*

## 4. Main features of the Biobank

### 4.1. Species representation

The top five species represented by material stored in the European animal biobanks are cattle, sheep, goat, pig and horse. Next come chicken, donkey, rabbit and bee. The five species being the least represented include; Trout, Turkey, Guinea fowl, Duck and other shellfish. The species representation reflects how easy it is to collect samples, balanced by their economic importance in agriculture. (Figure 4)

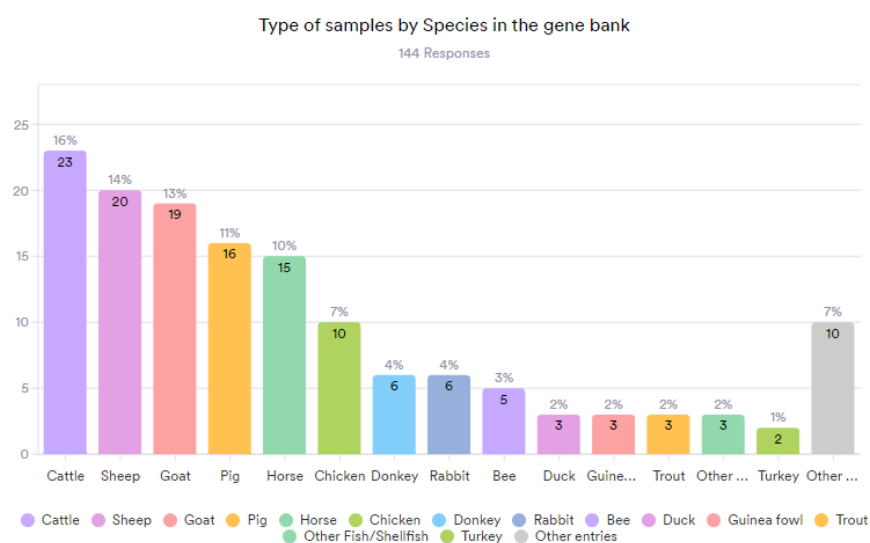


Figure 4: Distribution of material in the gene bank according to species

## 4.2. Biological material Representation

From the responses of the survey, semen samples represent the largest component of the stored material with 23% followed by blood, DNA and Embryo with 18%, 18% and 17% respectively (Figure 5). The material with the smallest percentage stored relative to the other samples, as expected, are cell-based *in vitro* models that include cell lines, genome-edited cells, stem cells and organoids. From this result, it can be deduced that majority of the biobanks, only include a small number or are yet to include *in vitro* cellular models in their operations. (Figure 5)

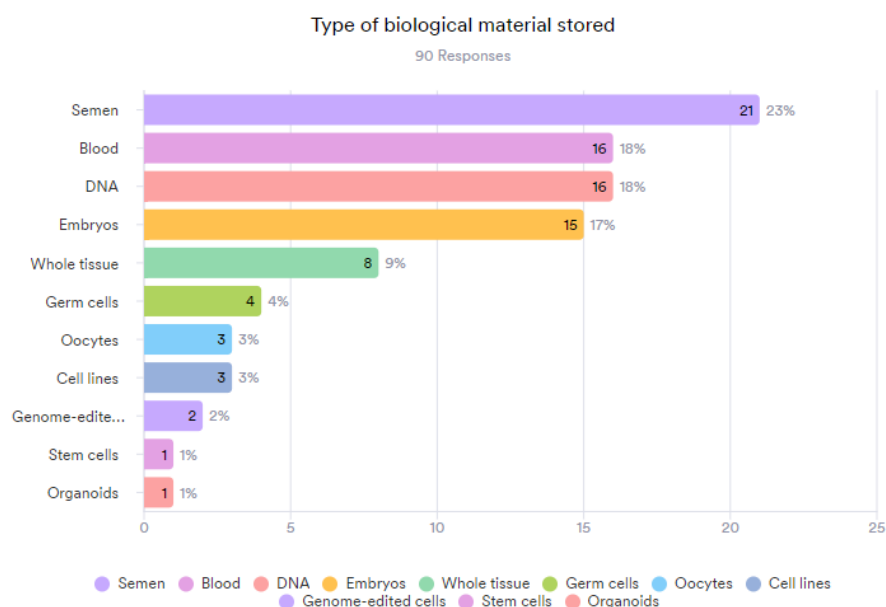


Figure 5 : Type of biological material stored in the biobank (number in the column indicates the number of biobanks storing this type of material)



### 4.3. Institution hosting the gene bank

Most of the gene banks are hosted by a public research institute or a University. Very few are managed by public-private partnerships and none directly by Ministry and Government agencies (Figure 6).

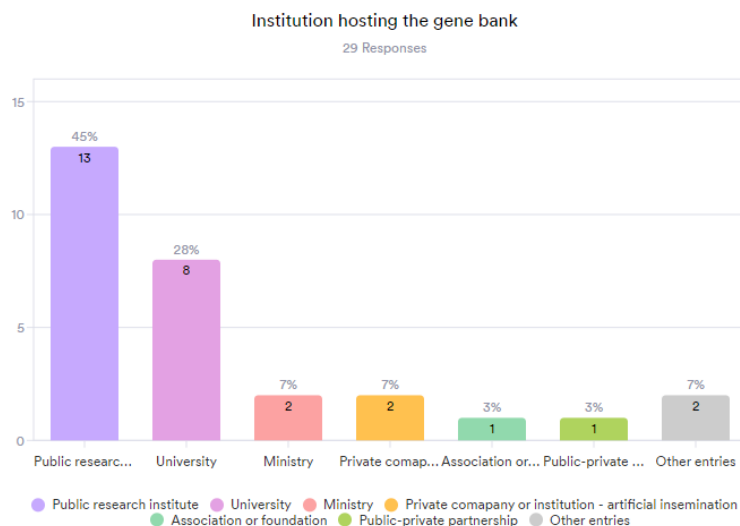


Figure 6: Institution hosting the gene bank

### 4.4. Genetic material duplication

The duplication of a collection consists of storing a part of the collection in a backup site, this is an important factor for securing the collections. From the survey result, 59% of the gene banks in Europe duplicated their genetic material collections while the remaining 41% are yet to duplicate their collection. Out of those that have a backup site for their collections, only 24% have a full duplicate of their collection, the remaining 76% partially duplicate their collections. (Figure 7)

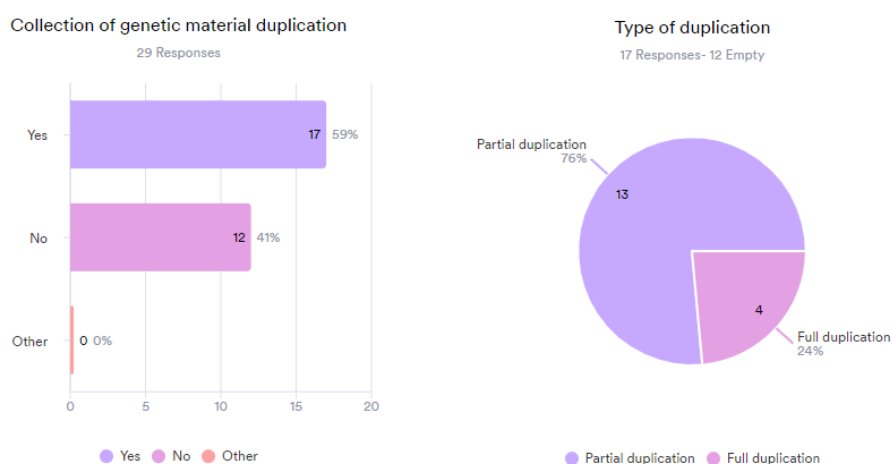


Figure 7: Rate of duplication of collections and type of duplication

#### 4.5. Ownership right of genetic material

The majority of the collections were owned by the institution managing the collection and the breeding organization providing the material with percentages of 25% and 25% respectively, followed by public research institute with 15% (Figure 8).

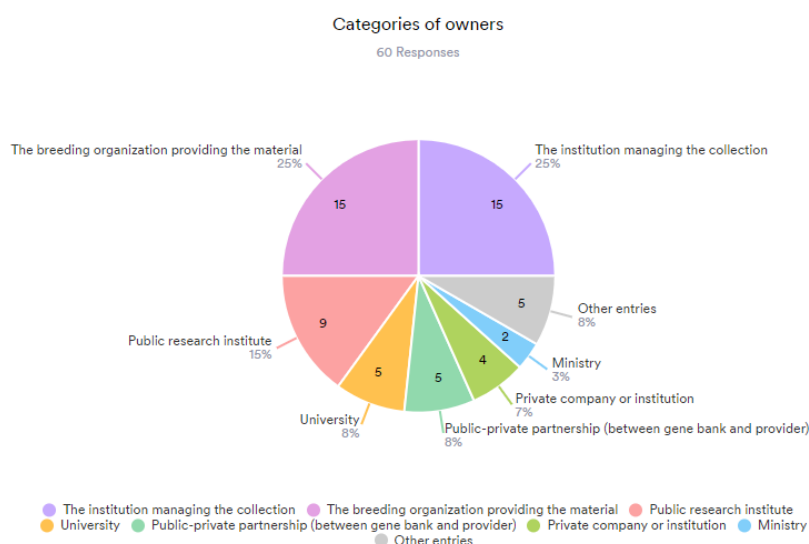


Figure 8: Categories of owners

### 5. Biobanking Agreements and Access

#### 5.1. Material Acquisition Agreement (MAA)

For the purposes of the survey, we defined the Material Acquisition Agreement (MAA) as any kind of formal agreement or contract that exists to regulate the acquisition of material by the biobank, as recommended by FAO. From the answers to the survey, it was found out that 76% of the gene banks regulate the acquisition of the biological material in their collection using a MAA.

Although the remaining 24% do not use MAA, it does not necessarily mean that they do not regulate or have specification for the acquisition of biological material.

The type of information included in a MAA is shown in Figure 9, the top 5 categories of information include; donor animal, property rights, veterinary/sanitary status, access conditions, phenotype information.

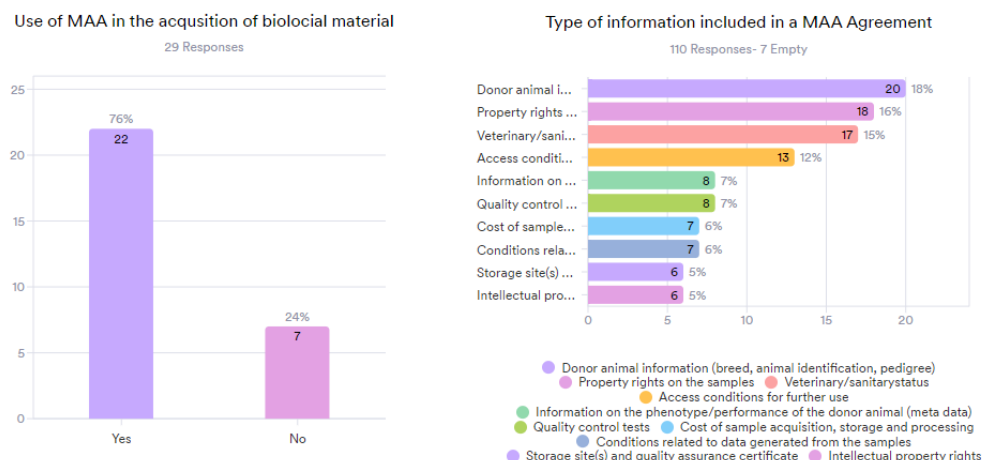


Figure 9: Use of a MAA in the acquisition of biological material and type of information included within the MAA

## 5.2. Access and use of collections

Only 3% of the biobanks currently make their collections available for use without restrictions. For all the others, 24% answered they were partially available for use, whereas the others have their collections available depending on the type of use (48%) or use is dependent on the provider (14%). Two organizations answered 'not applicable' to the question because they have not worked on who can use the collection yet. Some mentioned that availability for use depends both on the type of use and the provider. It is observed from this result that conditions for access are most often determined by type of use. (Figure 10).

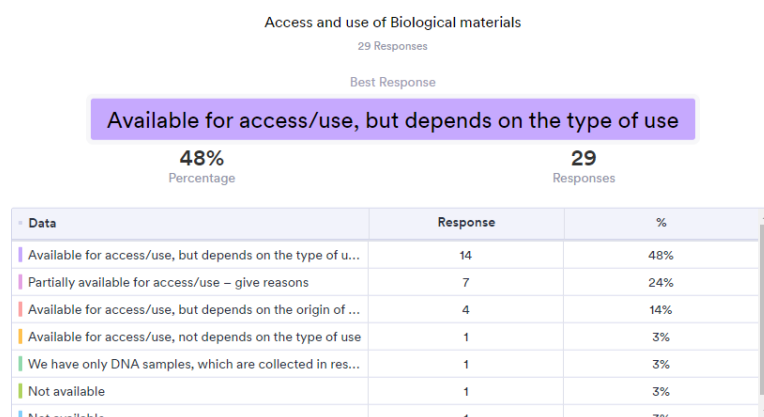


Figure 10: Access and use of biological material.

### 5.3. Material Transfer Agreement (MTA)

In the context of this project, Material Transfer Agreements (MTAs) is an agreement that grants the user a temporary custody of biological material of the provider. It defines the right of the provider and the rights and obligations of the users with respect to biological materials. As shown in Figure 11, the percentage of organizations that use Material Transfer Agreements (MTAs) to distribute their biological materials was 52% while 48% indicated they did not use MTAs.

It was also observed that most responding biobanks (59%) follow standard operating procedures for distribution of material to users or are in the process of developing these (Figure 11).

Among the types of information included in the MTA (Figure 12) was, for example, awareness of the Nagoya Protocol on Access and Benefit Sharing and its implication. However, only 6% of the biobanks include Nagoya information in their MTAs. This can be due to the fact that most of the European countries have not implemented a national law or have adopted the Nagoya protocol but do not apply access measures to their genetic resources of farm animals.

The majority of biobanks also did not include information about SOPs in their MTAs but did include information about rights to use and distribute the material for example.

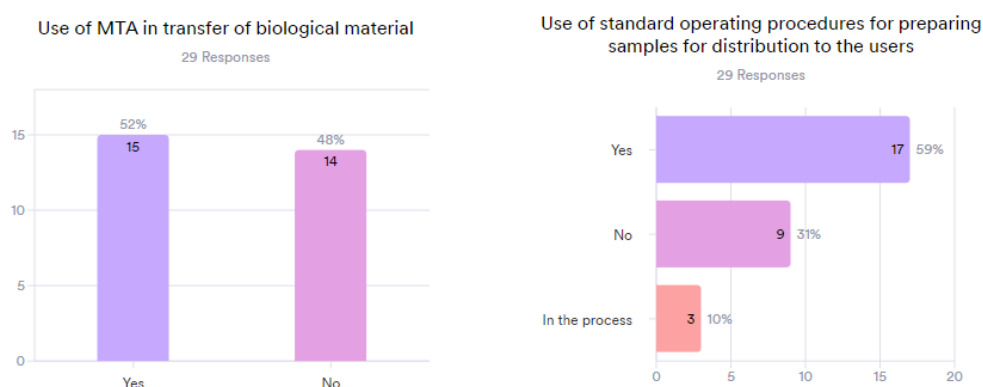


Figure 11: Use of MTA and SOP in the transfer and distribution of biological material.

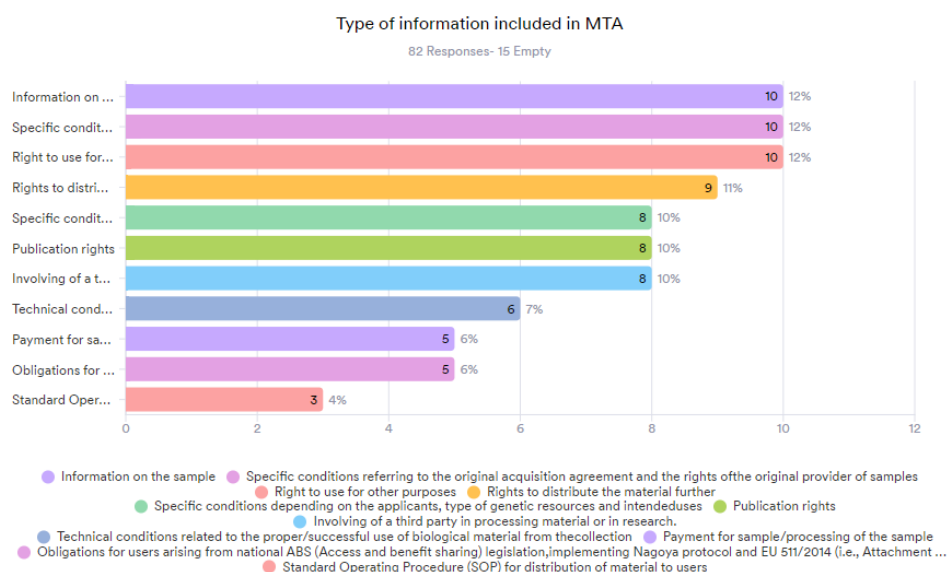


Figure 12: Type of information included in the MTA.

## 6. Willingness to participate in a network of biobanks for cellular model

### 6.1. Service of storage for stem cells, organoids, genome-edited cells

Out of the answers received, 69% of the gene banks are considering offering a future service for storage for stem cells, organoids and genome-edited cells. Among the remaining 31%, only 14% were not interested. The rest would be interested in offering the service if they could meet the following conditions; Training, Equipment, Space, Budget to cover the cost and Legal permit. The interested gene banks will be contacted for more information in the second step of the survey, (Figure 13).

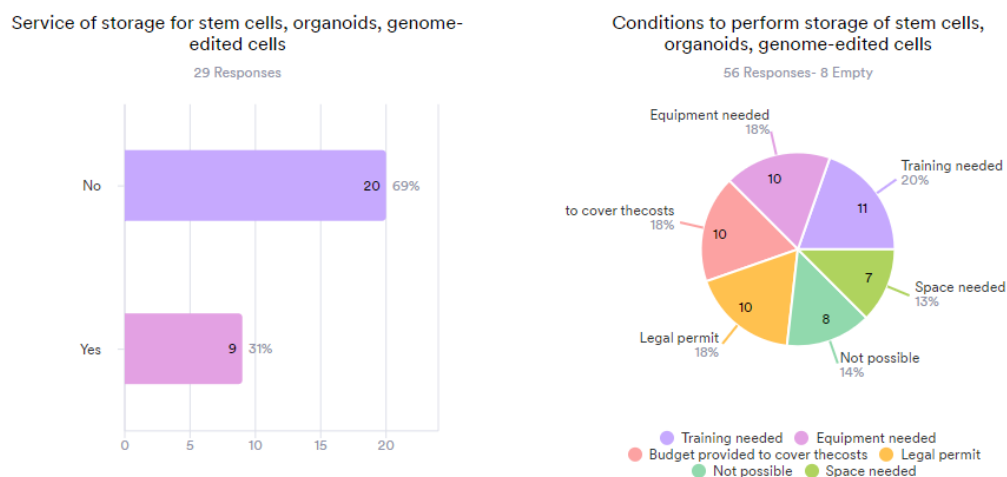


Figure 13: Service of storage for stem cells, organoids, genome-edited cells.

### 6.2. Service for amplification, regeneration of stem cells, genome-edited cells

According to Figure 14, only 21% of the gene banks already considered offering a service for amplification, regeneration of stem cells, and genome-edited cells. The majority (79%) answered no but expressed the willingness to perform the service. To achieve this, they would need training, equipment, space, budget to cover the cost and legal permit.

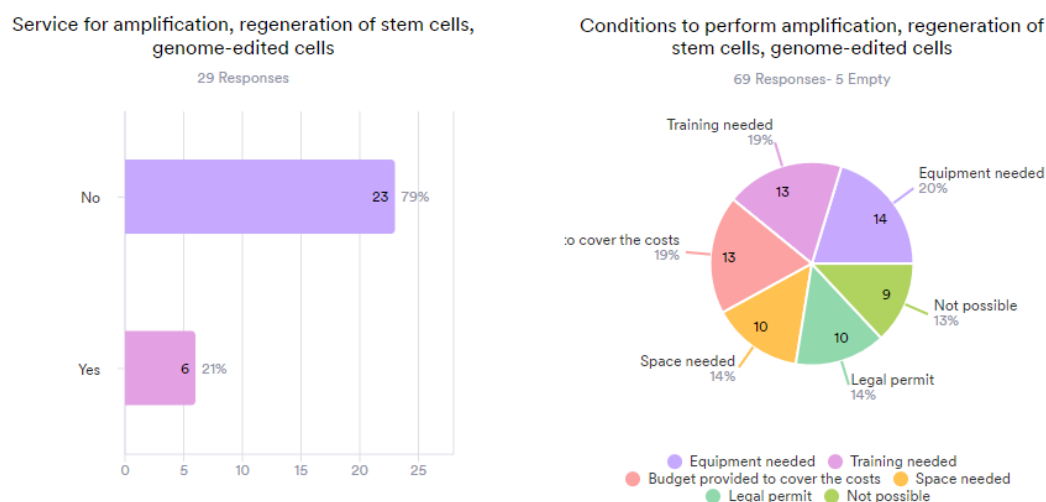


Figure 14: Service for amplification and regeneration

### 6.3. Service of production of organoids from stem cells stored

From the answers, it appeared that 86% of the gene banks are not considering to perform the service of producing organoids but would be interested if the following conditions were in place; training, equipment, space and budget to cover the cost. 13% of biobanks were not considering and also not ready to perform the service. Only 14% were already considering to offer a service producing organoids. (Figure 15).

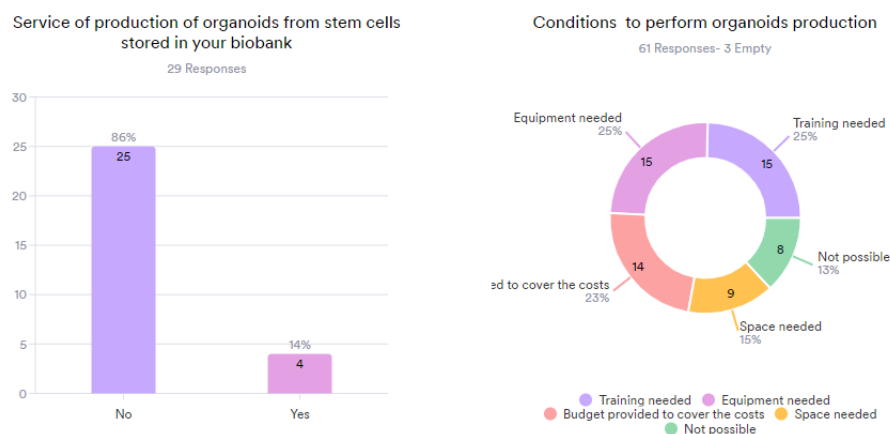


Figure 15: Service of organoids production

### 6.4. Access to cell culture lab

From the responses, 52% of the biobanks have access to a cell culture lab while the other 48% do not. The latter are interested in performing cell culture with the provision of training, equipment, space and budget to cover costs. Only 17% do not see the possibility to perform cell culture at all. (Figure 16)

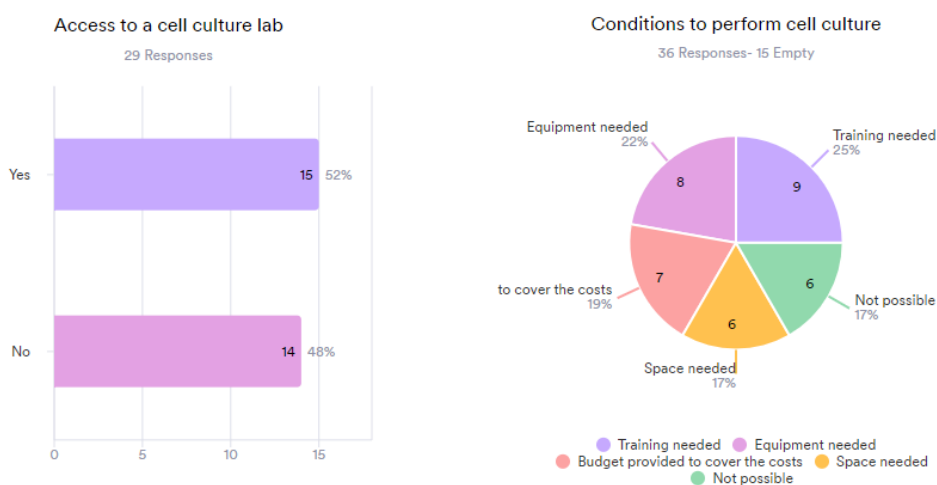


Figure 16 : Access to cell culture lab

## 6.5. Possibility to handle storage in liquid nitrogen

The percentage of the biobanks that see the possibility to handle storage in liquid nitrogen (83%) is much higher than that of those that do not (17%). This result is not surprising because the majority of existing biobanks use liquid nitrogen and follow SOPs for the cryopreservation of their materials (mostly reproductive material) as shown in Figures 17,18. Most of the biobanks that answered 'no' do not have enough budget to cover the cost but are willing to handle storage in liquid nitrogen if the cost is covered and if space, training and equipment are provided. Only 3 biobanks do not see the possibility at all.

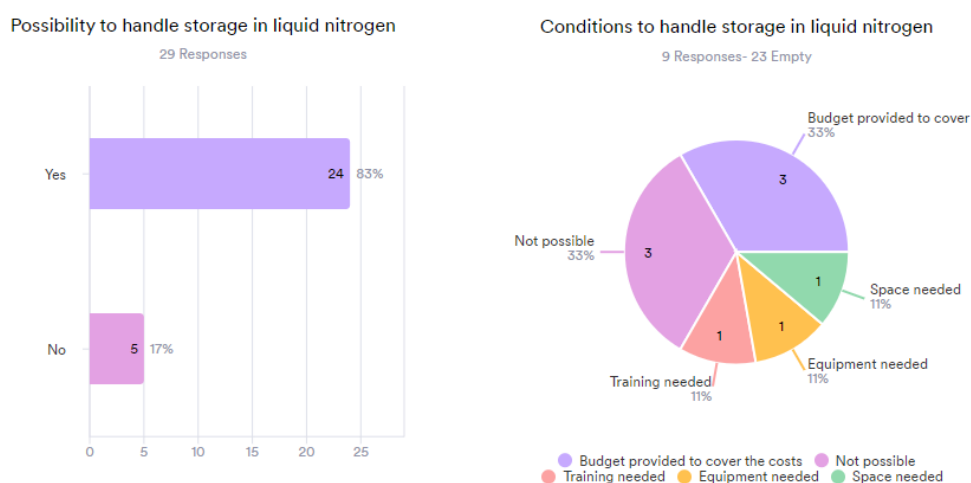


Figure 17 : Possibility to handle storage in liquid nitrogen

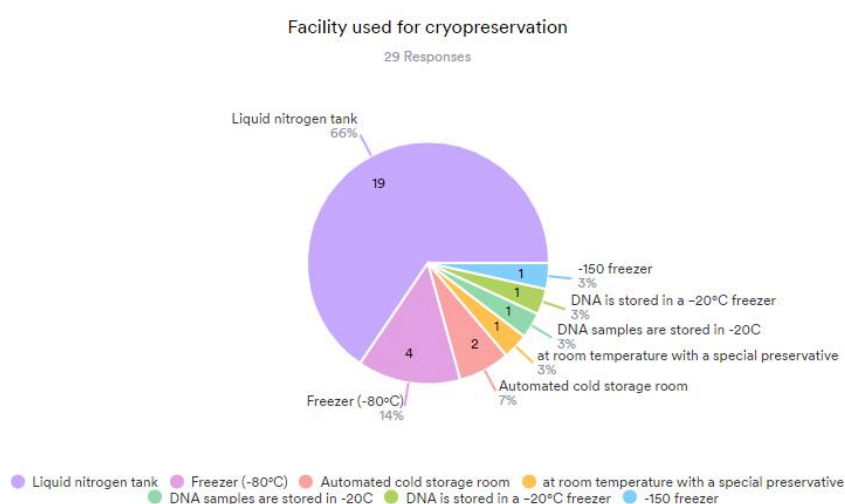


Figure 18 : Facility used for cryopreservation

## 6.6. Involvement in a network

### 6.6.1. National network

At the country level, 48% of the biobanks are involved in a national network, while 52% are not (Figure 19). In several countries (France, Italy and Spain), some collections are part of a national cryobank network for animal genetic resources where partners are sharing information or where some of the biological materials are stored in a common place (France/individual nodes of the CRB Anim project ; Spain).

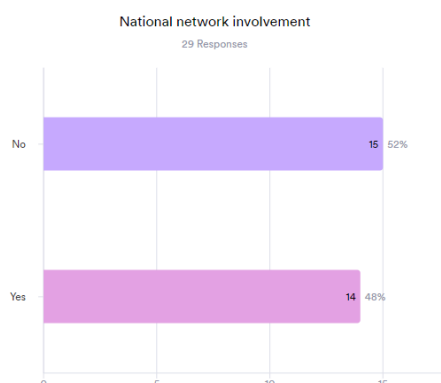
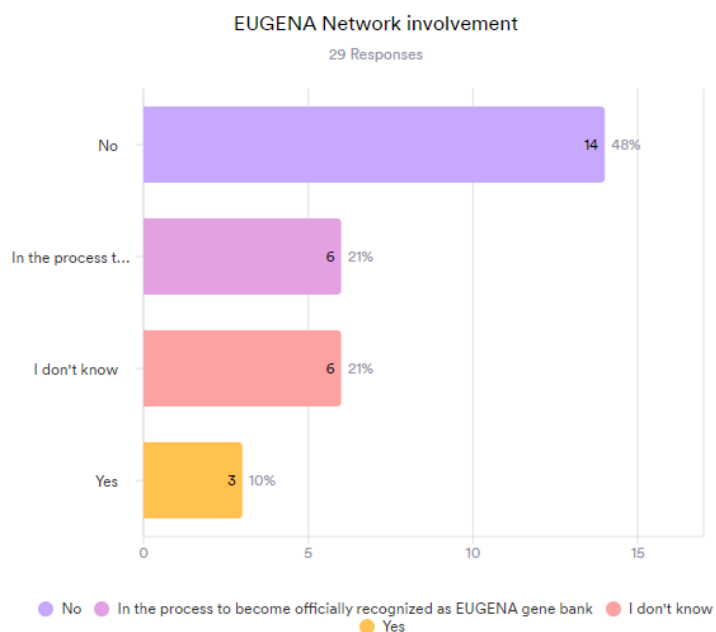


Figure 19 : National network involvement

### 6.6.2. Involvement in the EUGENA (European Genebank Network for Animal Genetic Resources) Network

The EUGENA brings together genebanks under the umbrella of the European Regional Focal point for Animal Genetic Resources with the objective to support the ex situ conservation and sustainable use of the livestock in Europe (<https://www.eugena-erfp.net/en/>). The EUGENA terms of reference were finalized in 2014 which is fairly recent and may explain why a mere 10% of the biobanks indicated that they were involved in the EUGENA network (Figure 20). A more encouraging 21% are in the process of becoming recognized in EUGENA, however 48% of the biobanks are neither participating nor have enough knowledge about the network. As such the EuroFAANG research infrastructure project can help with the promotion of the EUGENA initiative.

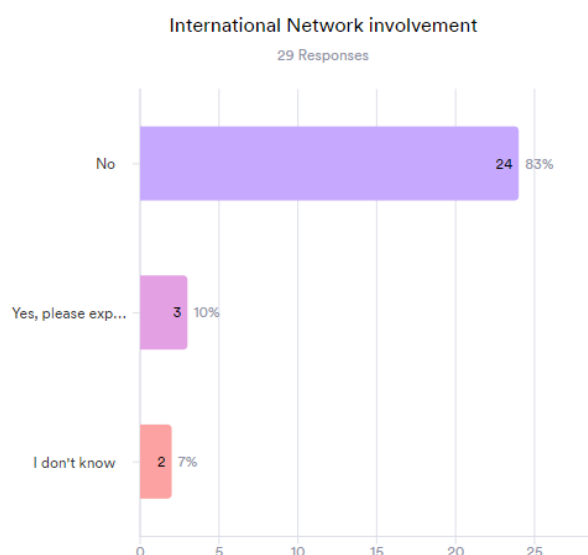




*Figure 20 : EUGENA network involvement*

### 6.6.3. International network

Only 2 gene banks stated that they were participating in an international network. One mentioned the FAANG initiative, FrAgENCODE collection of the French pilot project for FAANG (<https://www.fragencode.org/>) and the other respondent did not specify. (Figure 21)



*Figure 21 : International network involvement*

## 7. Conclusion and perspectives

In conclusion, the results of the survey showed there is a strong interest and an important potential in Europe to set up biobanking services for cellular models in order to support genotype to phenotype research in farmed animals. The list is given in Table 1. Even without any additional funding, a core set of a few biobanks would be ready to contribute in the short term, while many more would join if the development of EuroFAANG as a research infrastructure could help them to get the necessary equipment and the training.

In order to understand the steps to be undertaken to connect this core set as well as the interested biobanks to a common portal, an additional survey will be sent to get more precise information on their information system, quality management and fee policy procedures.

The current survey will remain open in order to get additional respondents and build a larger picture over the duration of the EuroFAANG research infrastructure project.

**Table 1 : Summary of the biobanks already considered and those that expressed the possibility to offer biobanking services for cellular models.**

Biobank ID	Country	Storage service	Stem cells service	Organoids production	Cell culture lab
National Research Institute of Animal Production, National Bank of Biological Material	Poland	Yes	Possibly	Possibly	Not possible
Animal Molecular Biology Department of the National Research Institute of Animal Production	Poland	Yes	Possibly	Possibly	Yes
Research Institute for Farm Animal Biology	Germany	Yes	Yes	Possibly	Yes
French National Cryobank	France	Yes	Not possible	Possibly	Yes
The Roslin Institute	Scotland	Yes	Yes	Possibly	Yes
Centre for Genetic Resources, the Netherlands	Netherlands	Yes	Possibly	Yes	Yes
INVESTIGACIÓN Y SANIDAD VETERINARIA S.L.P.	Spain	Yes	Yes	Yes	Possibly
Centre for Tropical Livestock Genetics and Health - International Livestock research Institute	Kenya	Yes	Yes/Possibly	Yes/Possibly	Yes
Nordic Genetic Resource Center	Norway	Yes/Possibly	Yes/Possibly	Yes/Possibly	Yes
Natural Resources Institute Finland	Finland	Possibly	Possibly	Possibly	Yes
Instituto Nacional de Investigação Agrária e Veterinária	Portugal	Possibly	Yes/Possibly	Possibly	Possibly

The Farm animal cryobank IBBA-CNR	Italy	Possibly	Possibly	Possibly	Yes
Agricultural Research and Education Centre Raumberg-Gumpenstein	Austria	Possibly	Possibly	Possibly	Possibly
Center Research Andalusian of Agriculture	Spain	Possibly	Possibly	Not possible	Possibly
CENTRO DE TRANSFERENCIA AGROALIMENTARIA	Spain	Possibly	Possibly	Possibly	Possibly
Animal Biological Resources for Integrated and Digital Genomics	France	Possibly	Not possible	Possibly	Possibly
Friedrich-Loeffler-Institut - Institut for Farm Animal Genetics	Germany	Possibly	Possibly	Possibly	Yes
Laboratorio de Genética-Facultad de Veterinaria UCM	Spain	Possibly	Possibly	Possibly	Not possible
University of Huelva	Spain	Possibly	Possibly	Possibly	Possibly
SUISAG	Switzerland	Possibly	Possibly	Possibly	Not possible
Banco de Germoplasma BIOMEJAN AGR218	Spain	Possibly	Possibly	Possibly	Possibly
Universidad de Zaragoza	Spain	Not possible	Not possible	Not possible	Yes
Department of Agricultural, Food and Environmental Science, University of Perugia	Italy	Not possible	Not possible	Possibly	Possibly
UMR Interactions hôtes environnement dans les maladies tropicales négligées dues aux trypanosomatidés	France	Not possible	Not possible	Not possible	Yes
Danijela Bojkovski	Slovenia	Not possible	Not Possible	Not possible	Yes
Biología de la reproducción	Spain	Not possible	Not possible	Not possible	Yes
Laboratorio Central de Veterinaria	Spain	Not possible	Not possible	Not possible	Yes

## 8. Annex

### 8.1. The EuroFAANG Biobank Questionnaire

#### TITLE:

**A Survey for investigating the readiness of the European Animal biobanks to support Genotype to Phenotype (G2P) Research by including in vitro cellular models in their collections.**

#### Introduction

This survey is part of EuroFAANG, an INFRA-DEV project (2023-2025), which aims at developing the concept of a European infrastructure for farmed animal genotype to phenotype research (<https://cordis.europa.eu/project/id/101094718>). The partners involved in this project include; FBN (coordinator), INRAE, WU, EMBL, EFFAB, NMBU, UEDIN.

The goal of this survey is to identify the issues associated with biobanking of in vitro cellular models and the need to support the development of G2P Research for farm animal genetic resources in Europe. These models include; stem cells, genome-edited cell lines, organoids (tiny, self-organized three-dimensional tissue cultures derived from stem cells), etc.

To clarify the vocabulary, this survey refers to the definition of biobanking provided by ISO 20387/2018 standard.

#### Biobanking

process of acquisition and storing, together with some or all of the activities related to collection, preparation, preservation, testing, analyzing and distributing defined biological material as well as related information and data.

#### Acquisition

act of obtaining possession and/or custody of biological material and/or associated data

#### Biological material

any substance derived or part obtained from an organic entity such as a human, animal, plant, microorganism(s) or multicellular organism(s) that is(are) neither animal nor plant (e.g. brown seaweed, fungi)

There are 3 sections and 22 questions in the survey. You should be able to finish this survey within 15-20 minutes or less. If you wish to have an overall view of the survey, you can download the text of the survey as a pdf [here].

We expect your answers before June 10th. The result of this survey will be shared with all the contributors in the project to help improve the concept of EuroFAANG Infrastructure, prepare access rules and stimulate collaboration in G2P research on farm animal genetic resources.

The synthesis of all answers will be sent by September 2023 to the contact e-mail address that you will provide in section A.

Thank you for your contribution to this survey.

NB: This survey allows you to save as a draft, continue or finish later.

## **A. GENERAL INFORMATION**

### **1. Please fill in the contact information for the entity performing biobanking or the entity managing the collections of biological samples in your institution.**

- Full name of the entity
- Acronym of the entity
- Location of the entity; Street address, Zip, City, Country
- Phone number
- Email address (please do not provide a personal email address but a generic email address, as much as possible)
- Geographical location (s)
- Website URL

### **2. What type of institution is hosting your gene bank?**

- Ministry
- Government Agency
- University
- Public research institute
- Private company or institute – artificial insemination\*
- Association or foundation
- Public-Private Partnership
- Other- please specify

### **3. From which species do you store biological material? Select all that apply**

- Cattle
- Sheep
- Goat
- Horse
- Pig
- Donkey
- Rabbit
- Chicken
- Turkey
- Duck
- Quail
- Guinea fowl
- Trout
- Salmon
- Other fish/shellfish
- Bee
- Other – please specify

### **4. What type of biological material do you currently have in your gene bank?**

- Whole tissue
- Blood
- Semen
- DNA
- Embryos
- Germ cells
- Oocytes
- Stem cells
- Cell lines
- Genome-edited cells
- Organoids
- Other – please specify

**5. For which purposes does your entity store biological material?**

*Please rank the purpose in decreasing order of priority:*

- Research
- Genetic diversity studies
- Support *in situ* conservation of local/native breeds
- Long term conservation, as insurance policy for unknown future
- Develop new lines/breeds with specific characteristics
- Possibility to recreate lost breeds or lines lost
- Genotype to phenotype association studies
- Biomedical model
- In vitro cellular model
- Generic studies for gene mapping and genome annotation
- Selection signature (monitoring selection response at the DNA level)

**i. Do these goals differ according to species?**

- Yes, please explain
- No

**6. Who has ownership right(s) to the biological material in your collections? Select all that apply.**

- The institution managing the collection
- Ministry
- Government Agency
- University
- Public research institute
- Private company or institute
- Association or foundation
- The breeding organization providing the material
- Public-Private partnership (between the gene bank and the provider)

- Other – please specify

**i. Are there differences in ownership of biological material according to species?**

- Yes (explain)
- No

**7. Do you have any legal framework, other than ownership and sanitary, which applies to some of the biological materials stored in your gene bank?**

- Yes
- No

**i. If yes, describe which legal framework**

- Access and Benefit sharing
- GMO regulations
- Other – please specify

**8. Are you part of a network at a national level?**

- Yes
- No

**i. If yes, describe the network and your position in the network: Text**

- Biobanking network [Text]
- Research network [Text]
- Training network [Text]

**9. Is your gene bank recognized by your national government as a member of EUGENA gene bank network for long-term conservation?**

- Yes
- No
- In the process to become officially recognized as EUGENA gene bank
- I don't know

**i. Is your collection part of any other international network?**

- Yes, please explain
- No
- I don't know

## **B. ACQUISITION, STORAGE AND TRANSFER OF BIOLOGICAL MATERIAL**

### **➤ Biological material acquisition**

**10. Do you have specific rules or requirements for choosing donor animals and/or for sampling of biological material in your gene bank?**

- Yes
- If yes, please explain
- No

**11. Is there a formal agreement/contract to regulate the acquisition of biological material by your entity? (Material Acquisition Agreements, MAA)**

**Help test: Acquisition refers to the entry of material in collection**

- Yes
- No

**i. If yes, what are the components included in the acquisition agreement? Help text: Agreement about the acquisition/entry of samples to be stored in the collection**

- Donor animal information (breed, animal identification, pedigree)
- Information on the phenotype/performance of the donor animal (meta data)
- Property rights on the samples
- Cost of sample acquisition, storage and processing
- Veterinary/sanitary status
- Quality control tests
- Storage site(s) and quality assurance certificate
- Access conditions for further use
- Conditions related to data generated from the samples
- Intellectual property rights

**ii. Please specify any other elements or clauses included in the acquisition agreement: [Text]**

### **➤ Transfer of biological material**

**12. Is the biological material kept by your entity available for use?**

- Available for access/use, not depends on the type of use
- Available for access/use, but depends on the type of use
- Available for access/use, but depends on the origin of samples or the provider
- Partially available for access/use – give reasons
- Other – please specify



- i. Please specify your 3 major criteria for granting access to biological material from your entity:

[Text]

[Text]

[Text]

**13. Do you use Material Transfer Agreements (MTA) for distributing biological material to users?**

- Yes
- No

- i. If yes, which of the following elements or clauses are included in the Material Transfer Agreement (MTA) implemented by your gene bank?

- Information on the sample
- Specific conditions referring to the original acquisition agreement and the rights of the original provider of samples
- Specific conditions depending on the applicants, type of genetic resources and intended uses
- Technical conditions related to the proper/successful use of biological material from the collection
- Payment for sample/processing of the sample
- Obligations for users arising from national ABS (Access and benefit sharing) legislation, implementing Nagoya protocol and EU 511/2014 (i.e., Attachment of IRCC (Internationally Recognized Certificate of Compliance) with Prior Informed Consent, PIC and MAT)
- Publication rights
- Rights to distribute the material further
- Standard Operating Procedure (SOP) for distribution of material to users
- Right to use for other purposes
- Involving of a third party in processing material or in research.

- ii. Please specify any other specific elements or clauses included in the MTA implemented for your collection. [Text]

➤ **Storage of biological material**

**14. What type of facility do you use for cryopreservation of your materials?**

- Freezer (-80°C)
- Liquid nitrogen tank
- Automated cold storage room
- Other – please specify

**15. Do you follow standard operating procedures for cryopreservation of the biological materials?**

- Yes, the procedures used are standard procedures from the literature or another source
- Yes, the procedures used were developed within the gene bank
- No

**16. Is there a duplicate collection of the genetic material on a secondary/back-up site? Help text: samples from one animal/sampling are stored in two sites (duplicate site)**

- Yes
- No
- Other

**i. If yes, what type of duplication?**

- Full duplication
- Partial duplication

**17. Do you have standard operating procedures for preparing samples for distribution to the users?**

- Yes
- No
- In the process

### **C. CELLULAR MODELS INFORMATION**

**18. Would you consider offering a service of storage for stem cells, organoids, genome-edited cells?**

- Yes
- No

**i. If yes, you can provide details here: [Text]**

**ii. If no, what would be the conditions for you to perform this service?**

- Training needed
- Equipment needed
- Space needed
- Budget provided to cover the costs
- Legal permit
- Not possible

**19. Would you consider offering a service for amplification, regeneration of stem cells, genome-edited cells?**

- Yes
- No

**i. If no, what would be the conditions for you to perform this?**

- Training needed
- Equipment needed
- Space needed
- Budget provided to cover the costs
- Legal permit
- Not possible

**20. Would you consider offering a service of production of organoids from stem cells stored in your biobank?**

- Yes
- No

**i. If no, what would be the conditions for you to perform this?**

- Training needed
- Equipment needed
- Space needed
- Budget provided to cover the costs

- Not possible

**21. Do you have access to a cell culture lab?**

- Yes
- No

**i. If no, what would be the conditions for you to perform cell culture?**

- Training needed
- Equipment needed
- Space needed
- Budget provided to cover the costs
- Not possible

**22. If you do not currently use liquid nitrogen tank, do you see the possibility to handle storage in liquid nitrogen?**

- Yes
- No

**i. If no, what would be the conditions for you to handle storage in liquid nitrogen?**

- Training needed
- Equipment needed
- Space needed
- Budget provided to cover the costs
- Not possible

**ii. If yes, have the main risks to the use of liquid nitrogen been identified?**

- Yes
- No

**a) If yes, which are the most important risks identified?**

- Loss of stored biological material due to failure of liquid nitrogen tanks
- Injury or accidental death of staff (e.g., due to Asphyxia, burns)
- Difficulty to hire and keep necessary personnel and key expertise
- Use of non-validated procedures and protocols for collection and freezing
- Insufficient funding to cover the new costs
- Non-compliance with national/international laws and regulations
- Loss of regular, affordable source of liquid nitrogen
- Other – please specify

**b) Have specific preventive measures been taken to reduce the risks and respond to the risks, should they occur?**

- Yes, for all the risks
- For only some of the risks