Deliverable 4.6

Framework for equitable partnership and connecting industry for pre-competitive research

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Changes with respect to the DoA (Description of Action)

*Complete as appropriate *

Dissemination and uptake

*Complete as appropriate, also for further use within the project, depending on whether the document is confidential or public. If confidential a summary (see below) is mandatory, but it is also useful for public deliverables.

Table of Content

NOTES:

1. In the introduction refer to the WP context, i.e. its objective, and, where relevant to, earlier deliverables. Please do not repeat information on the entire project here but come to the point, i.e. explain only the direct context of your work done to achieve this deliverable in a short introduction, which differs from the summary.

2. We have set as Font Calibri 12 pt; please try to keep it and be consistent within the document and use British English spelling.

3. All figures should have short legends; tables should have numbered headers;

4. All abbreviations should be spelt out once,

5. Methods and other references should be quoted as indicated (e.g. PERTEA et al. 2016) and listed under 5. References (similar to a draft publication) in the style indicated there.

6. Finally, all relevant partners should have been consulted for approval sending (word and pdf versions) to the coordinator for submission (preferred way). We can then insert the final dates, upload and submit. You can also upload the final version (only as pdf) into the Participants' Portal directly and inform us, so we can check and submit.

1. Summary of results

Short Summary of Results (around 250 words)

Deliverable 4.6 establishes a framework to guide equitable and transparent collaboration between research infrastructures and industry stakeholders in genotype-to-phenotype (G2P) research for farmed animals. Developed under Work Package 4 of the EuroFAANG research Infrastructure (RI) project, it supports the adoption of *in vitro* models to advance pre-competitive, ethical, and FAIR research aligned with the 3Rs principle (Replacement, Reduction, and Refinement) of animal use.

The framework was co-created through extensive stakeholder engagement across Europe, including surveys with breeding and biotech companies, biobanks, and animal health actors; a World Café workshop at the FABRE-TP AGM 2023; and continuous feedback from EuroFAANG partners. This participatory approach ensured the model reflects both scientific and industrial priorities.

Five key components underpin the framework: 1) a two-way partnership model promoting reciprocity; 2) an Open Sample Policy for transparent access and benefit-sharing; 3) integration of the 3Rs and responsible breeding principles; 4) clear IP and recognition mechanisms; and 5) biobanking integration to connect resources across Europe. Together, these components are complemented by a structured engagement-to-access pathway, which provides a practical roadmap for industry participation from initial contact through to formal access requests, informed by best practices from other research infrastructures (e.g. PigWeb).

The results create the foundation for future collaborations of industry stakeholders within GenoPHEnix and other infrastructures, fostering innovation while ensuring ethical standards, openness, and trust. By strengthening public–private interaction, this framework contributes to a more sustainable and competitive European animal research ecosystem with tangible societal and environmental benefits.

2. Introduction

Genotype-to-phenotype (G2P) research in farmed animals is entering a new era, driven by technological advances in cellular models, genome editing, and advanced multiomics data integration. However, the adoption of *in vitro* models for this research remains limited in the animal science community compared to their use in human and model organisms.

Work Package 4 of the EuroFAANG RI project addresses this gap by building the technical and organisational foundations to mainstream *in vitro* models in animal genomics. Task 4.3 specifically focuses on connecting industry stakeholders to the infrastructure through an equitable and pre-competitive partnership framework. The ultimate goal is to enable the breeding, biotech, and pharmaceutical sectors to actively contribute to and benefit from the EuroFAANG ecosystem.

This deliverable sets out the principles, mechanisms, and example pathways that will support equitable collaboration of industry partners into the future established infrastructure, facilitating mutual access to resources and knowledge while upholding scientific quality, transparency, and societal responsibility.

3. Core report

3.1. Objectives and Context

Deliverable D4.6 is part of Work Package 4 (WP4), which addresses the limited and fragmented use of *in vitro* cellular models in G2P research for terrestrial and aquatic farmed animals. While these models are widely used in human and model animal science, their uptake in animal breeding and livestock research remains low.

Task 4.3, led by EFFAB, aims to create stronger engagement between the EuroFAANG RI and industry stakeholders—particularly from the breeding, biotech, and pharmaceutical sectors—by showcasing *in vitro* models as promising tools for pre-competitive G2P research. In doing so, it supports the 3Rs principle and encourages greater industry participation in collaborative and responsible research.

The primary objective of D4.6 is to establish a collaborative framework for equitable partnership between research infrastructures and industry actors. This framework is designed to:

- Promote the use of *in vitro* cellular models in G2P research relevant to farmed animals
- Foster bilateral collaboration models based on mutual access to samples, expertise, and infrastructure
- Support the adoption of the "open sample" policy co-developed with Task 4.1 (ref to D4.3 Open sample policy)
- Contribute to other European biobanking and genetic resource conservation initiatives (e.g. EUGENA; reference to D4.5 Collaborative framework with EUGENA and industry users)
- Align with EuroFAANG's overarching goals of FAIR data, ethical research practices, and long-term research infrastructure development (link to WP3 deliverables)

3.2. Methodologies

To develop the framework presented in this deliverable, the following methodologies were applied:

- **Industry Survey on Public–Private Collaboration** *(related to Task 4.3)***:** Distributed to breeding companies, biotech firms, and animal health actors to assess interest in collaboration, knowledge of in vitro systems, and barriers to participation.

- **Biobank Survey** *(linked to Task 4.1 and Deliverable D4.3):* Targeted biobanks and research institutions to understand sample availability, sharing mechanisms, and harmonisation needs

- **Survey on Code EFABAR and Genetic Diversity (***linked to activities on responsible breeding and WP2 and 4)***:** Investigated how companies implement responsible breeding principles and approach genetic diversity.

- **World Café at FABRE-TP AGM 2023 (***complementary to WP8 dissemination and stakeholder activities)***:** An in-person workshop held in Brussels, gathering both public and private sector stakeholders to discuss genome editing and biobanking. Two rotating groups allowed participants to share perspectives and challenges across both topics. Results and more details on the world café available here (see D5.3)

- **Informal Interviews and Feedback Loops:** Through WP meetings, emails, and side discussions, insights were gathered continuously from EuroFAANG partners, breeders, and technical experts.
- **Experiences were also drawn from three founding Research Infrastructures of GenoPHEnix—**Pigweb, SmartCow and AquaExcel—which have each piloted Transnational Access (TNA) schemes that included industry partners. These initiatives demonstrated how clear eligibility rules, transparent access procedures, and co-funded project calls can successfully involve private companies while maintaining scientific integrity. The experience informed the design of the EuroFAANG equitable access principles proposed in this deliverable.

These engagement activities ensured that the resulting framework reflects the concerns, expectations, and priorities of the community it is intended to serve.

3.2.1. From engagement to access: guidelines for involving industry partners

To operationalise equitable collaboration, the framework outlines a practical pathway for engaging industry partners, inspired by previous approaches such as those developed under the **PigWeb** project. The process follows four key stages:

- **Initial contact and interest mapping:** Industry stakeholders are invited through open calls, dedicated networking events, or bilateral contact to express interest in using or contributing to EuroFAANG resources.
- **Concept note and feasibility screening:** Interested partners outline their research question or intended use of in vitro models. The RI assesses whether the proposal aligns with pre-competitive objectives and available capacities.
- **Access request submission:** A simplified request form—modelled after PigWeb's Transnational Access (TNA) procedure—formalises the collaboration. It includes information on materials needed, expected outputs, and benefit-sharing conditions.
- **Co-development and monitoring:** Once approved, the partner engages with the scientific teams to implement the work plan, with continuous feedback loops ensuring transparency and fairness.

This pathway ensures consistency, inclusiveness, and transparency from first contact to project completion, while remaining adaptable to future infrastructures such as **GenoPHEnix**.

3.3. Framework Components

The equitable partnership framework proposed in this deliverable consists of five core components. Each was shaped by stakeholder input gathered through surveys and workshops, and aligns with the goals of WP4, particularly the promotion of in vitro models under the 3Rs principle.

The framework interprets **"equitable"** as ensuring that all participants—public or private—contribute and benefit in proportion to their input, with clear recognition of intellectual, financial, and material contributions.

"Pre-competitive research" refers to collaborative activities conducted before the emergence of direct commercial applications, where partners share data, tools, or models to advance collective scientific understanding. This stage enables innovation while avoiding conflicts of commercial interest.

- **Two-Way Partnership Model**

A central feature of the framework is its reciprocity: industry stakeholders (e.g. breeding companies, biotech firms) provide access to elite biological materials, phenotypic information and other applied knowledge (e.g., see D6.2 "Report on existing and required interfaces to the animal farming industry for integrating genome and phenotype information"), while public research infrastructures contribute expertise, models, protocols, and facilities for *in vitro* G2P research. This structure fosters trust and co-creation, with both sides benefiting from the collaboration.

- **Open Sample Policy**

Informed by the open science principles promoted by FAANG and Task 4.1 (D4.3), this policy promotes transparent and FAIR access to shared *in vitro* models and materials. It includes conditions for data/sample sharing, eligibility criteria, and benefit-sharing rules. By defining how biological materials can be shared in a pre-competitive context, it is possible to remove uncertainty and to facilitate long-term collaboration.

- **3Rs Principles Integration**

The framework embeds ethical research values by prioritising *in vitro* tools that contribute to the Replacement, Reduction, and Refinement of animal use. This alignment not only meets societal expectations but also increases the regulatory and commercial acceptability of outcomes derived from these models.

- **Benefit-Sharing and IP Considerations**

To address industry concerns, the framework acknowledges the importance of clear benefit-sharing mechanisms. This may include recognition of material contributions, co-authorship, limited IP rights, or joint development clauses. For example, data encryption has been proposed as a possible means to alleviate concerns over data confidentiality (see D6.2). The overall goal is to protect legitimate commercial interests while ensuring open collaboration in a pre-competitive setting.

- **Biobanking Integration**

The framework supports harmonised and interoperable biobanking practices by encouraging the shared use of biorepositories. It links to initiatives such as EUGENA and leverages the outputs of Tasks 4.1 and 4.2 (D4.1, D4.2, D4.4) to ensure common metadata standards and operational procedures. This enhances discoverability, reuse, and long-term preservation of *in vitro* resources.

3.4. Achievements

- **Development of an equitable partnership framework** based on evidence from three surveys and a multi-stakeholder workshop, identifying the conditions and principles for future collaboration between public infrastructures and industry.
- **Stakeholder engagement through surveys and events**, including direct outreach to breeding companies, biobanks, and public–private networks. These efforts established relationships and gathered feedback that shaped the framework.
- **Inclusion of industry perspectives in WP4 discussions**, particularly regarding *in vitro* model adoption, sample access conditions, and benefit-sharing preferences.
- **Exploratory outreach to EUGENA**, initiating dialogue on how EuroFAANG's work aligns with long-term genetic diversity conservation and biobanking policy development.

3.5. Evidence from Stakeholder Engagement

Insights gained from stakeholder consultations strongly influenced the framework:

- **Public–Private Survey** revealed strong support for EuroFAANG's coordination role, with openness to sharing under clear governance and IP policies.
- **Biobank Survey** indicated a fragmented but motivated ecosystem, willing to collaborate under shared standards.
- **Code EFABAR Survey** confirmed the relevance of linking responsible breeding commitments to infrastructure access.

- **World Café** highlighted the importance of transparency, governance, and mutual trust in any future open-access model.

4. Conclusions and Forward-Looking Recommendations

Deliverable D4.6 provides a foundational structure for engaging industry in the EuroFAANG infrastructure through transparent, mutually beneficial, and ethical collaboration models. By promoting *in vitro* G2P research under the 3Rs principle, this framework contributes to a more sustainable, efficient, and socially responsible research landscape.

The use of bilateral partnerships, open sample access, and integration with biobanking services strengthens Europe's capacity to lead in animal genomics while preserving genetic diversity and fostering innovation.

4.1. Forward-Looking Recommendations

While the EuroFAANG RI project concludes with this deliverable, the framework it developed offers a solid foundation for the development and implementation of future partnerships with the animal breeding and genetics industry to be realised by the new GenoPHEnix infrastructure (https://genophenix-ri.eu) currently under consideration for inclusion in the updated ESFRI Roadmap (2026).

To maximise the legacy and relevance of this work, the following recommendations are proposed:

- **Maintain and strengthen public–private dialogue**

  Use established platforms like EFFAB, FABRE TP, and EUGENA to continue structured engagement with industry regarding uptake of *in vitro* systems. Leverage the interest shown in surveys and workshops to create regular forums or working groups around pre-competitive research.

- **Pilot the equitable partnership model in future initiatives**

  Apply the proposed framework in Horizon Europe or national-funded projects to test its practical implementation. Include mechanisms for feedback and revision based on actual industry and research user experiences.

- **Formalise and promote the Open Sample Policy**

  Ensure that the draft principles developed in this task are further refined and embedded in the access conditions of biobank services, ideally linked to the EuroFAANG Data Portal.

- **Align biobank governance with diversity and ethical breeding goals**

  Coordinate metadata standards, access procedures, and transparency tools so that they reflect EFABAR principles and support responsible, long-term conservation of genetic resources.

- **Encourage *in vitro* literacy and training for industry**

  Address knowledge gaps identified in the surveys by integrating *in vitro* model training into workshops, summer schools, and technical exchanges between academia and breeders.

- **Sustain engagement through related infrastructures**

  Where possible, link EuroFAANG results with other infrastructures such as EMBRC, INFRAFRONTIER, or new G2P-related platforms. Their longer-term funding structures could offer continuity to maintain access and collaboration pathways. Continued implementation and stakeholder engagement will be essential to embed these practices into long-term EuroFAANG/GenoPHEnix operations.

- **Organise a GenoPHEnix workshop to align definitions and expectations**

  Building on the framework established in EuroFAANG, GenoPHEnix could host an online or hybrid workshop in 2026 bringing together breeding companies, biotechnology firms, and RI representatives. The goal would be to co-define practical interpretations of equitable and pre-competitive research, identify shared research priorities, and explore co-funding mechanisms for pre-competitive initiatives for *in vitro* G2P research. This activity would strengthen community alignment and support harmonised engagement across sectors.

- Broaden the Horizon: Connecting to Technology Infrastructures and Innovative Companies

  The framework underlying this document can be further developed through the continued expansion of GenoPHEnix as a European platform for genomic and phenomic livestock data that are relevant for research, innovation, and the development of market-oriented products. As elaborated in WP6, robust data governance and encryption strategies will be essential to enable secure collaboration across research and innovation ecosystems.

  In line with current European policy discussions on strengthening the link between knowledge generation and impact, including the growing emphasis on early interaction between Research Infrastructures (RIs) and Technology Infrastructures (TIs), GenoPHEnix could function as a networking and facilitation platform that brings together researchers, technology providers, innovative companies, and investors at an early stage of development. Such early connections can support the scaling of

promising innovations and improve the translation of research results into practical applications.

In this context, targeted collaborations with Technology Infrastructures and small innovative companies could be explored, in line with the strategic objectives of the European Strategy on Research and Technology Infrastructures. Early networking activities and pilot projects could be supported and interconnected through a dedicated GenoPHEnix platform, allowing innovations to gain visibility, attract investment, and build traction beyond the research phase. Further detailing of these mechanisms can be addressed during the preparatory phase.