A European infrastructure
for farmed animal genotype to phenotype research

Deliverable 8.1

Report on Global EuroFAANG animal agriculture G2P networking event

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1. Executive Summary

Background	The EuroFAANG Research Infrastructure builds upon a legacy and global momentum that has been developing for more than a decade. EuroFAANG is the European focal point for an ongoing global effort towards advancing and accelerating animal genotype to phenotype research. It is crucial for the overall success of the EuroFAANG RI project to maintain and further develop its close ties to global Functional Annotation of Animal Genomes (FAANG) activities and wider community efforts. This includes alignment and development of standards, data coordination strategies, policy, new technology developments and combining datasets. An important annual gathering point for the animal agriculture community is the Plant and Animal Genome Conference (PAG), that takes place in San Diego, USA, each January. The conference is well attended by both the global community and many of the key European institutes and scientists.
Objectives	To hold a globally focussed EuroFAANG animal agriculture genotype to phenotype networking event at the Plant and Animal Genome Conference (PAG) in San Diego.
Methods	Rather than hold a separate standalone event, it was quickly determined that the most effective strategy for high engagement and impact would be to incorporate our global networking event as part of a larger 'Global FAANG Workshop' which was accepted as a special whole day workshop to celebrate '10 years of the FAANG consortium' at PAG. The event focussed on the progress made in the functional annotation of domestic animal genomes over the last decade. The event was held on 16th January 2024 at the Plant and Animal Genomes conference (PAG31) in San Diego, California. Emily Clark (UEDIN) was part of the global FAANG workshop organising committee to shape the EuroFAANG networking events position within the overall event.
Results & implications	The 'EuroFAANG global networking event' took place during the morning component of the full day Global FAANG workshop. The event included presentations from the H2020 GENE-SWitCH, AQUA-FAANG and BovReg projects. Progress on the EuroFAANG Research Infrastructure (RI) Project was presented by Emily Clark (UEDIN) with a focus on the networking opportunities the project provides for global collaboration, such as the European think-tank on genome

	editing (WP5) and planned workshop for G2P in a Dish in February 2025 for WP4. Peter Harrison (EMBL-EBI) presented an update on the FAANG Data Portal and data access management in the context of the EuroFAANG RI Project (WP3). Crucially for the objectives and furthering the efforts of the EuroFAANG RI the workshop included many opportunities to network and discuss with colleagues from across the globe during coffee breaks, lunch, and evening follow on meetings and the organised round table discussions. The EuroFAANG RI project also played a prominent role in another key global networking event, the AGBT-Ag Conference that was held in Phoenix Arizona from the 15th-17th April 2024. AGBT-Ag is "the preeminent genome science and technology conference for top global researchers, leaders, and innovators". The meeting was organised by EuroFAANG RI WP2 leader Martien Groenen (WU). Emily Clark presented the EuroFAANG RI project to the attending delegates and Richard Croojmans (WU) provided a summary of biobanking and the recent survey completed for the EuroFAANG RI Project (WP4). The EuroFAANG RI project is dedicated to maintaining global networking as a core strategic objective and will actively participate in major upcoming international events, such as PAG, ISAG, and AGBT-Ag workshops. This engagement is particularly crucial as the EU and US advance into the next stages of their infrastructure, network, and research-led frameworks in farmed animal science and production.

2. Global FAANG Networking Event at PAG 2024

At the Plant and Animal Genomes conference (PAG31) in January 2024 in San Diego, California, the EuroFAANG Research Infrastructure Project held a global networking event. This event was part of the 'Global FAANG Workshop' which was a special whole day workshop to celebrate '10 years of the FAANG consortium' and the progress made in the functional annotation of domestic animal genomes over the last decade. Emily Clark was part of the overall event organising committee to position our networking event effectively as part of the programme. The EuroFAANG RI was represented at the event by Emily Clark (UEDIN) (WP1&5), Peter Harrison (EMBL-EBI) (WP3, 7 &8), Martijn Derks (WU) and Marta Godia (WU) (WP6), Martien Groenen (WU) (WP2), Richard Croojmans (WU) and Elisabetta Giuffra (INRAE) (WP4).

The agenda for the workshop is shown in Figure 1 and full details of the workshop, including the presentations, can be accessed via this link: https://www.faang.org/bbs?s=2024workshop..txt

10:50 AM	*Welcoming Remarks.*
10:55 AM	**Ten years on, how do we measure success of FAANG?**
11:05 AM	**EuroFAANG - an Infrastructure for Farmed Animal Genotype to Phenotype Research in Europe and Beyond.** *Presenting Author: Emily L. Clark.*
11:20 AM	**Aims and Outcomes of H2020 GENE-Switch (The regulatory GENomE of SWine and CHicken: Functional Annotation during development).**
11:50 PM	**Epigenomic Regulation of Gene Transcription across Tissues at Different Developmental Stages.**
12:20 PM	**AQUA-FAANG: Empowering Aquaculture Research and Innovation By Genome Functional Annotation.** *Presenting Author: Peter W. Harrison.*
12:35 PM	**The FAANG Data Coordination Centre: Driving MetaFAIR, Global Coordination and EuroFAANG Objectives.** *Presenting Author: Peter W. Harrison.*
12:50 PM	Lunch break
1:50 PM	**Final report on USDA-NIFA Pig FAANG Resource Project.**
2:20 AM	**The H2020 BovReg Project: An Integrated Functional Annotation of the Bovine Genome.**
2:50 PM	**Functional Annotation of the Chicken Genome.** *Presenting Author: R. David Hawkins.*
3:20 PM	**Ovine FAANG Update.**
3:35 PM	**Contributions of Equine FAANG to the Research Community.** *Presenting Author: Jessica L. Petersen.*
3:50 AM	**Validation of Including Functional Genome Annotation Maps in Genomic Prediction Using FAETH Scores.** *Presenting Author: Derek M Bickhart.*
4:05 PM	Break
4:25 PM	**Faang Task Force Report and Update.** *Presenting Author: Hao Cheng.*
5:25 PM	*Implement the next phase of FAANG (Round Table Discussion).*
6:25 PM	*Concluding Remarks.*

Figure 1. Details of the global FAANG workshop at PAG 2024 on the 16th of January which included global networking opportunities facilitated by the EuroFAANG RI Project.

The main goals of the workshop were to: 1) promote information exchanges regarding recent FAANG efforts worldwide, 2) provide a forum for the FAANG community to communicate and foster interactions and collaborations. The workshop brought together many international scientists in animal genomics to discuss how to develop new strategies for resource and capacity building to meet the needs of the FAANG initiative. Such information sharing among attendees from across the globe provided opportunities for the international exchange of new ideas, technology, data and cooperation.

The 'EuroFAANG global networking event' took place during the morning component of the workshop which included presentations from the H2020 GENE-SWitCH, AQUA-FAANG and BovReg projects in the morning and the US FAANG projects in the afternoon. There were many very positive comments about the progress made and the outcomes of the H2020 projects, all of which had recently finished (GENE-SWitCH and AQUA-FAANG) or would finish within a month (BovReg). Peter Harrison (EMBL-EBI) then presented an update on the FAANG Data Portal and data access in the context of the H2020 projects and EuroFAANG RI Project WP3. Progress on the EuroFAANG Research Infrastructure (RI) Project was presented by Emily Clark (UEDIN) with a focus on the networking opportunities the project provides for global collaboration, such as the European think-tank on genome editing (WP5) and planned workshop for G2P in a Dish in February 2025 for WP4. At the time of the workshop colleagues in the US were awaiting the outcome of the USDA NIFA Research Community Networking (RCN) Grant which would fund similar activities to foster global collaboration.

The presentation by Peter Harrison, the Genome Analysis Team Leader at EMBL-EBI, covered several key aspects of the FAANG Data Coordination Centre (DCC) and its initiatives to support the FAANG community. The talk highlighted the EuroFAANG projects' role in supporting the FAANG Data Coordination Centre (DCC) at EMBL-EBI (Figure 2). The EuroFAANG initiatives drive the creation and maintenance of richly described, standardized, and validated genomic datasets, facilitating global data openness, reusability, and cross-project analysis. The DCC ensures consistent data reporting and facilitates the submission process to public archives, contributing to advanced annotations in the Ensembl Genome Browser. It also highlighted the future data coordination requirements of new breeding, phenotyping, biobanking, genome editing, and genomic technologies, aiming for a harmonized genome-to-phenome resource.

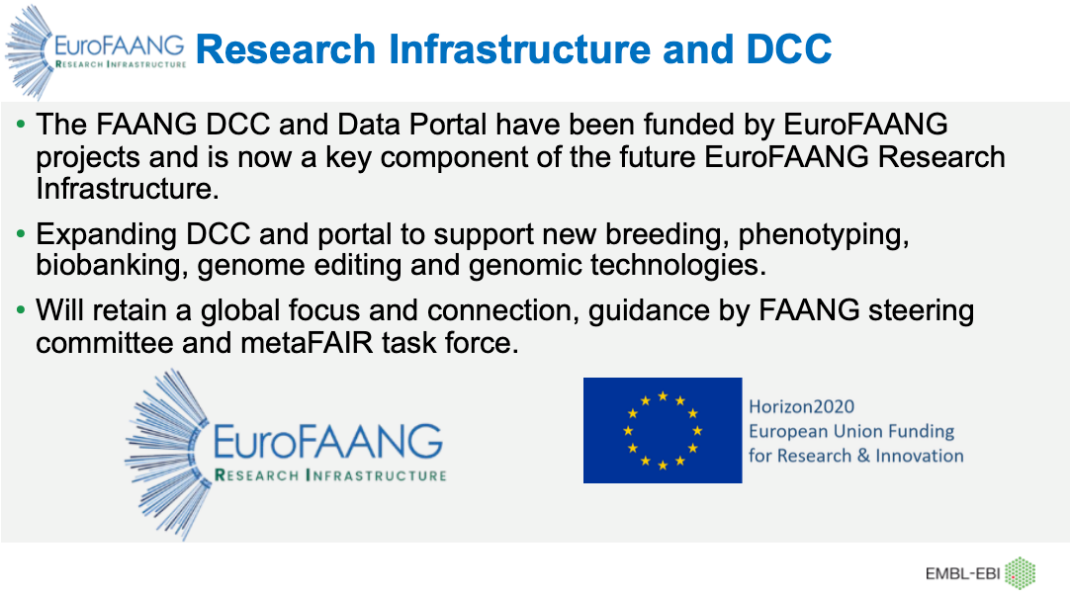


Figure 2. Slide excerpt from Peter Harrisons talk covering the key role the EuroFAANG RI will play in data coordination and standards.

The presentation by Emily Clark, from University of Edinburgh, introduced the EuroFAANG RI to the global audience, and its aims to establish a pan-European infrastructure to support genotype to phenotype (G2P) research in farmed animals. The talk focussed on four main objectives: creating a unified data structure and access through the FAANG Data portal, developing a European framework for biobanking cellular models, expanding capabilities in breeding and genomic technologies, and connecting with existing projects to consolidate G2P research. The talk highlighted the critical gap that the infrastructure fills in Europe, enhancing collaboration across the farmed animal research community, and aligning European and global research infrastructure to improve sustainable and efficient animal production.

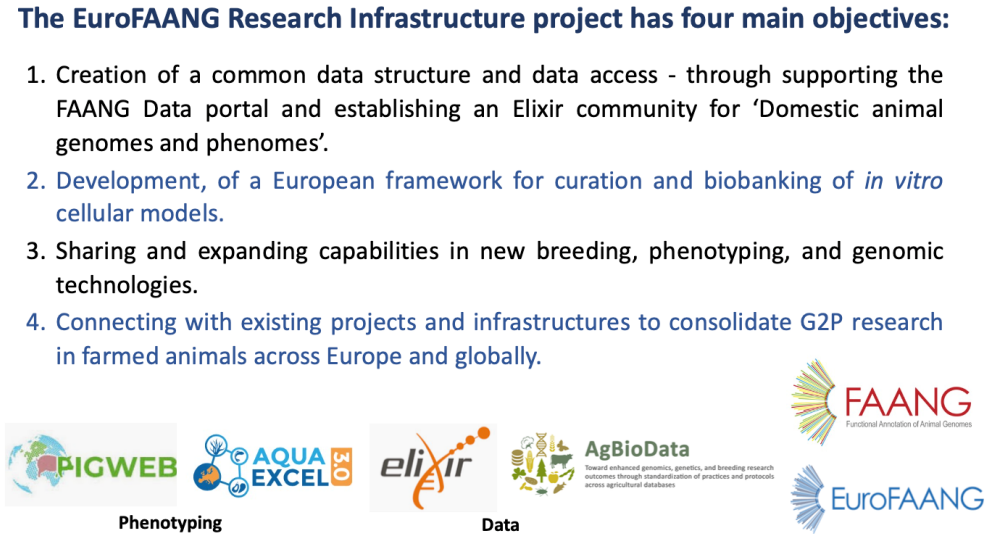


Figure 3. Slide excerpt from Emily Clark's talk covering the key aims and objectives of the EuroFAANG RI.

During the workshop there was the opportunity to network and discuss with colleagues from across the globe. European projects were well represented, though the majority of workshop attendees were from the US, which would be expected due to the location of the conference. There were approximately 65 attendees of the workshop in total, including representatives from academia and industry and one representative from the funder USDA NIFA.

At the end of the workshop the coordinators of the global FAANG project held a discussion about the future of FAANG. Topics that were discussed included support for data, metadata and genome curation and annotation, to continue to ensure the impact and accessibility of the data generated by the FAANG projects continues over the coming decade. We also discussed the route to application of the FAANG datasets including increasing scope into the animal health space, ways in which to share data with industry collaborators.

The main points from the roundtable discussion were as follows:

- Strengthening links and inviting collaboration with colleagues working with industry to facilitate a route to application of the FAANG datasets e.g. using machine learning to predict functional consequences of variants located in regulatory regions of the genome.
- Support for genome annotation, including the release of a community deployable RefSeq annotation pipeline by NCBI.
- Evaluation, if current task forces are working well and possible missing task forces. A task force on genome editing was proposed.
- Making datasets public at the end of funded projects, which is a requirement in Europe but not in the US at present.
- Ensuring that the metadata included with the datasets is according to the FAANG metadata specifications when it is uploaded.

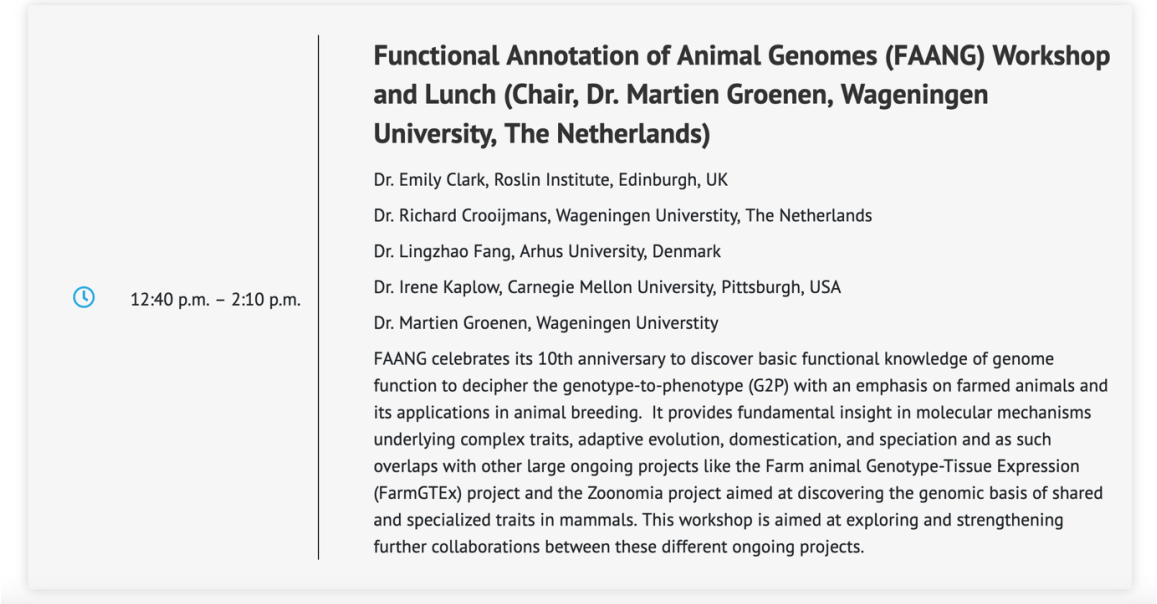
Overall the workshop as a whole, and the EuroFAANG global networking components, were very successful and strengthened global links and plans for the future. However because the outcome of at least two key strategic grants in the US for animal genomics from USDA-NIFA were not known at the time of the workshop many key strategy discussions were postponed to the AGBT-Ag meeting in April 2024.

3. FAANG Workshop at AGBT-Ag 2024

The AGBT-Ag Conference was held in Phoenix Arizona from the 15th-17th April 2024. AGBT-Ag is “the preeminent genome science and technology conference for top global researchers, leaders, and innovators”. Delegates were from across the globe and the conference included many very exciting new innovative ideas in plant and animal genomics.

Included within the meeting schedule are a series of workshops, and this year we were fortunate enough to include a FAANG workshop, to celebrate the achievements made in the last 10 years of the FAANG consortium. The workshop was organised by Martien Groenen (WU) and included four invited speakers (Figure 4). The speakers spanned different subject areas and included Dr Lingzhao Fang who talked about the FarmGTEx project which leverages gene expression information at scale to understand complex

traits in farmed animals, and Dr Irene Kaplow who talked about the Zoonomia Project which is an international collaboration to discover the genomic basis of shared and specialized traits in mammals.



12:40 p.m. – 2:10 p.m.

Functional Annotation of Animal Genomes (FAANG) Workshop and Lunch (Chair, Dr. Martien Groenen, Wageningen University, The Netherlands)

Dr. Emily Clark, Roslin Institute, Edinburgh, UK

Dr. Richard Crooijmans, Wageningen Universtity, The Netherlands

Dr. Lingzhao Fang, Arhus University, Denmark

Dr. Irene Kaplow, Carnegie Mellon University, Pittsburgh, USA

Dr. Martien Groenen, Wageningen Universtity

FAANG celebrates its 10th anniversary to discover basic functional knowledge of genome function to decipher the genotype-to-phenotype (G2P) with an emphasis on farmed animals and its applications in animal breeding. It provides fundamental insight in molecular mechanisms underlying complex traits, adaptive evolution, domestication, and speciation and as such overlaps with other large ongoing projects like the Farm animal Genotype-Tissue Expression (FarmGTEx) project and the Zoonomia project aimed at discovering the genomic basis of shared and specialized traits in mammals. This workshop is aimed at exploring and strengthening further collaborations between these different ongoing projects.

Figure 4. Agenda for the FAANG Workshop on Wednesday the 17th of April at the AGBT-Ag conference.

Through the workshop we hoped to strengthen collaboration between FAANG, EuroFAANG and these initiatives. Dr Emily Clark (UEDIN) described the opportunities provided by the EuroFAANG research infrastructure (RI) project, how the concept for the infrastructure and transnational access is developing and what would be required for success (Figure 5), and Richard Croojmans (WU) provided a summary of biobanking and the recent survey completed for the EuroFAANG RI Project (Figure 6).

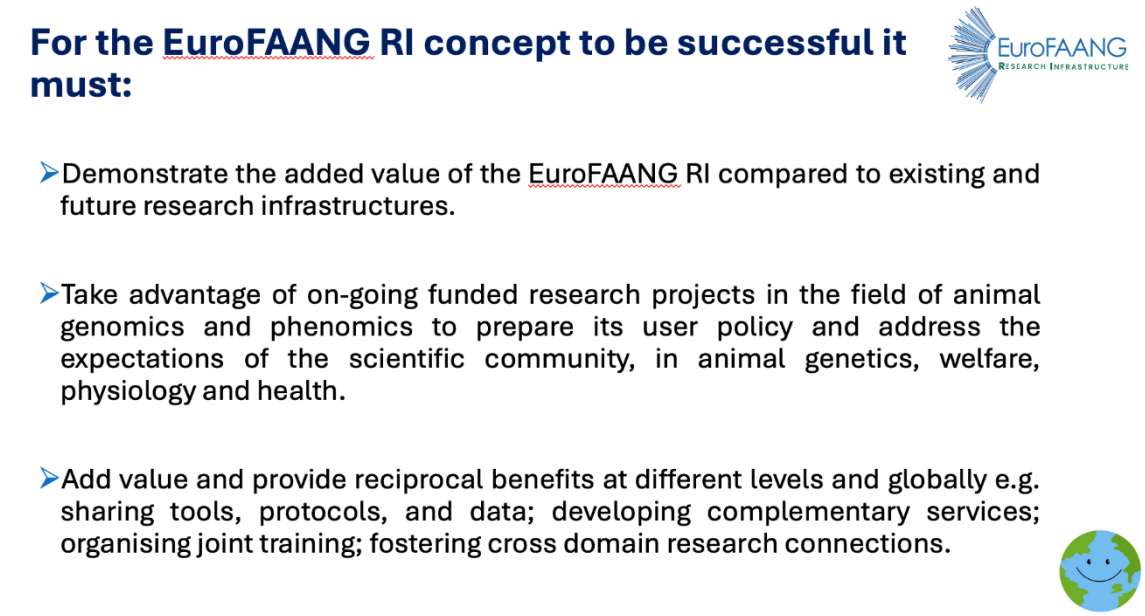


Figure 5: Slide presented by Emily Clark at the FAANG workshop at AGBT-Ag describing the components required for the success of the EuroFAANG RI and reciprocal benefits and opportunities globally.

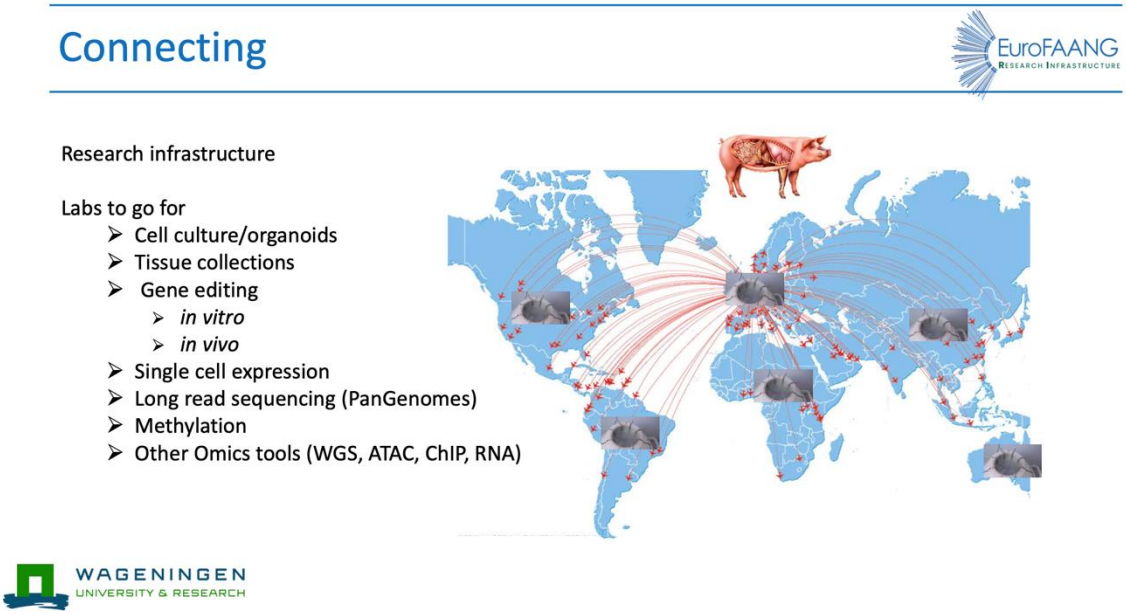


Figure 6: Slide presented by Richard Crooijmans at the FAANG workshop at AGBT-Ag describing the potential of the EuroFAANG RI to facilitate biobanking globally.

There was a lot of opportunity at the conference to discuss future funding initiatives in the US and Europe and the potential to developed shared strategies to meet the goals of the next 10 years of FAANG as well as development of a “new USDA blueprint for animal genomics research” for 2027-2035. This is a key strategic document that is guiding for research and funding in animal genomics replacing the previous blueprint from 2018-2027. As such it was important for representatives from the EuroFAANG RI project to attend these key initial strategic discussions and ensure that the concept we are developing for the EuroFAANG research infrastructure is in line with US as well as EU strategy and priorities for animal genomics research.

4. Future global positioning and further meetings

The EuroFAANG RI remains committed to global networking as an ongoing strategic goal, and will ensure a presence at key future global events including PAG (https://www.intlpag.org/), ISAG (https://www.isag.us/) and AGBT-Ag (https://www.agbt.org/events/agricultural-meeting-overview/) workshops, particularly as the EU and US advance into the next stages of their infrastructure, network, and research-led frameworks in farmed animal science and production.