



European Network on Livestock Phenomics (EU-LI-PHE): boosting high-throughput phenotyping for precision livestock farming and animal breeding

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**Funded by
the European Union**

What is a COST Action ?

- A COST Action is an **interdisciplinary research network** that brings researchers and innovators together to investigate a topic of their choice for 4 years.



Background concepts (I)

- Phenomics is emerging as a major new technical discipline in biology.
- **Phenomics can be defined as the ensemble of methodologies and technologies for the acquisition, analysis and exploitation of high-dimensional phenotypic data on an organism-wide scale.**



Background concepts (II)

1. Phenotyping is increasingly being recognised as a limiting factor in all applications of livestock genetics and genomics
2. Phenotyping is fundamental to routine and daily management of livestock populations in order to optimise reproduction strategies, disease control and welfare of the animals

We need:

- new phenotypes
- new ways to measure phenotypes
- new ways to use phenotypes



Action challenge

Foster the development, integration, organisation and practical implementation of technologies, tools, methods, approaches, models, expertise and resources useful to scan and interpret the **animal phenome** to paving the way for **novel scientific knowledge** and **applications** in the **livestock production sectors**.

Animal phenome

The physical and molecular traits of an animal.



Classification of the phenotypes

Animal phenotypes can be classified in different ways:

- 1) according to the level in which they are measured (e.g., cell, tissue, organ, or whole organism);**
- 2) the type of information that is recorded;**
- 3) the temporal acquisition of the information (e.g., a single event, a continuous event, or a combination of events);**
- 4) the objective of the collected parameters.**



Classification of the phenotypes

Targeted phenotypes can be:

- 1) dynamic** (changing rapidly within short periods of time)
- 2) stable** (minimal change across a predetermined time window)



Classification of the phenotypes

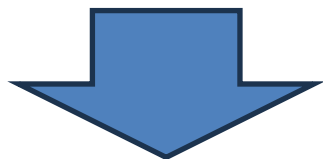
Depending on the level of analysis, phenotypes can be classified in:

- i) **external or final phenotypes** (e.g. performance, morphological, disease resistance and behavioural traits);
- ii) **internal or molecular phenotypes (endophenotypes)** (e.g. the level or the presence/absence of different types of biomolecules (and their modifications) in animal biofluids and tissues and so on).

Final phenotypes are determined by the contribution and interplay of many molecular phenotypes (with multi-level relationships) and their interaction with environmental factors.



Broad heterogeneity in phenotype classes



A wide array of scientific approaches and technologies can be used to capture and manage phenotypic information.



Research Coordination objectives (I)

1. Advancing state-of-the-art high-throughput technologies and protocols required for deep phenotyping which can describe phenotypic information at multiple levels in farmed animals (**WG1**)
2. Providing cross-disciplinary knowledge to develop new standards in phenotyping technologies, phenome data descriptors, phenotype ontologies, databases, data structures, storage and sharing, in line with open science policies (**WG1** and **WG3**)
3. Evaluating available software and bioinformatic tools and defining methods for effective data mining, processing, summarisation, integration and visualization of genome/epigenome to phenome data in livestock (**WG2** and **WG3**)
4. Exploring integrative dynamic responses and adaptations of animal phenomes to variable environmental factors (**WG2**)

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Research Coordination objectives (II)

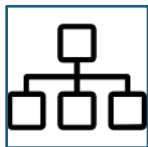
5. Exploring novel data integration and fusion approaches including omics and sensor data, images, videos and animal movement and sound data for generation and visualisation of complex system models of livestock populations to facilitate prediction of interventions and outcomes (**WG3**).
6. Investigating and proposing new applications for genomic selection and precision livestock farming (PLF) (**WG3**).
7. Exploring the regulatory landscape around livestock phenomics, including ownership of the data, open access data policies and intellectual property rights (**WG4**).
8. Analysing stakeholder opinions and societal perceptions of innovations in this field for the reduction of negative impacts on the animals and on the environment (e.g., to increase resistance to infectious disease, improve animal welfare and reduce environmental impacts) (**WG4**).



Capacity Building objectives

1. Providing well-trained Young Researchers and Innovators (YRI) and professionals in livestock phenomics and related disciplines that complement and complete the background and knowledge needed for the alignment of scientific progress and industry demands.
2. Fostering the exploration and implementation of new training routes and methodologies, some of them based on e-learning environments, with the aim of widening career prospects of highly specialised researchers who can accumulate integrated skills on different disciplines around big data production and analysis, with an interdisciplinary vision.
3. Stimulating new ideas and innovative methodologies in an open innovation framework to address new opportunities generated by livestock phenomics approaches with a comprehensive strategy of communication and dissemination and to benefit the whole scientific community, the relevant industrial sectors and all stakeholders, including policy and decision makers.
4. Fostering the involvement and collaboration of teams from less research-intensive countries across Europe; promoting their inclusiveness, through the sharing of new knowledge around a network of opportunities focused on livestock phenomics generated by other COST Members and International Partner Countries (IPC) with more developed research ecosystems.





Structure



Chair of EU-LI-PHE: Luca Fontanesi

Animal and Food Genomics Group
Department of Agricultural and Food Sciences,
University of Bologna



ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA

E-mail: luca.fontanesi@unibo.it



Vice-chair of EU-LI-PHE: Tomas Norton

Animal and Human Health Engineering (A2H)
Department of Biosystems (BIOSYST), KU Leuven

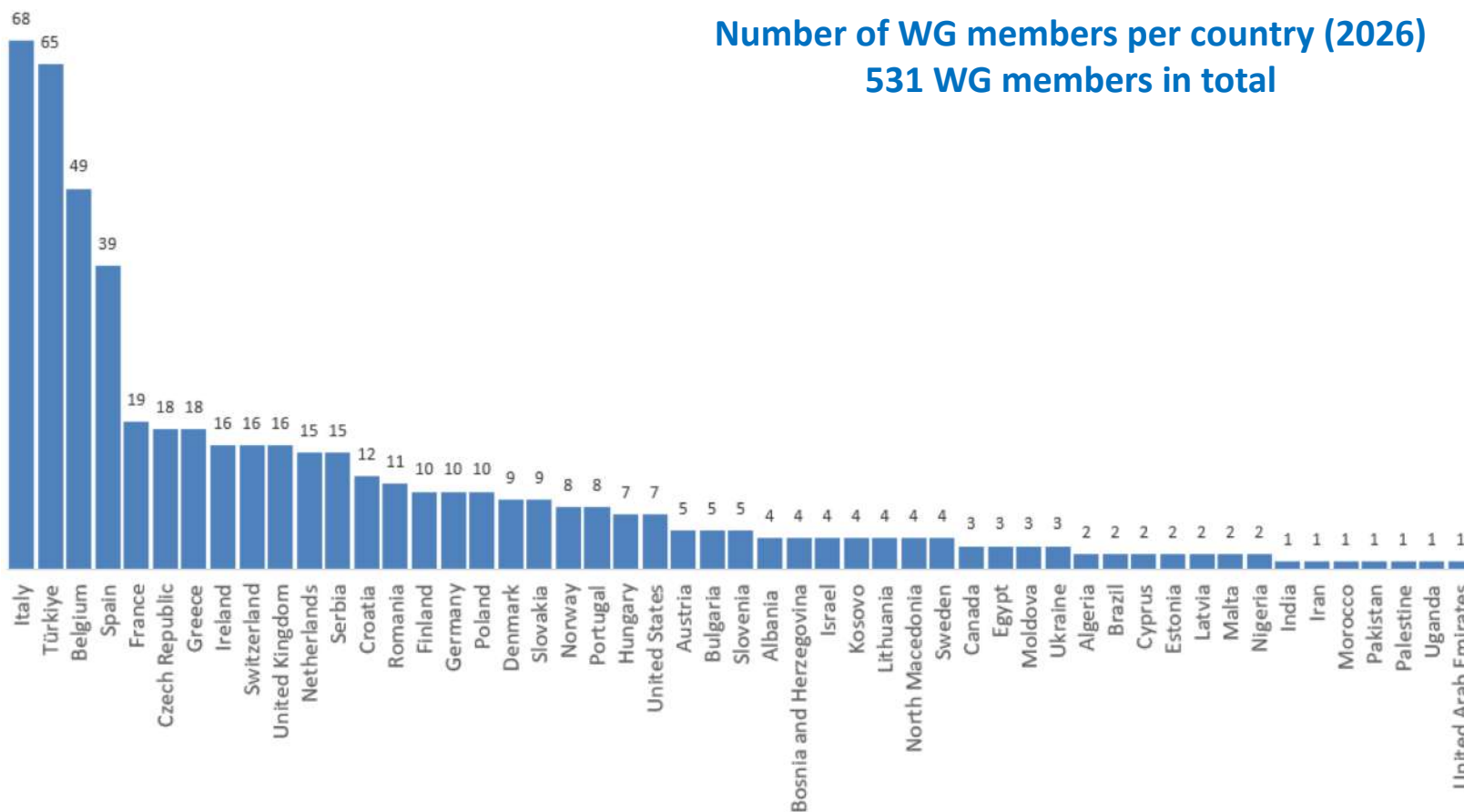
KU LEUVEN

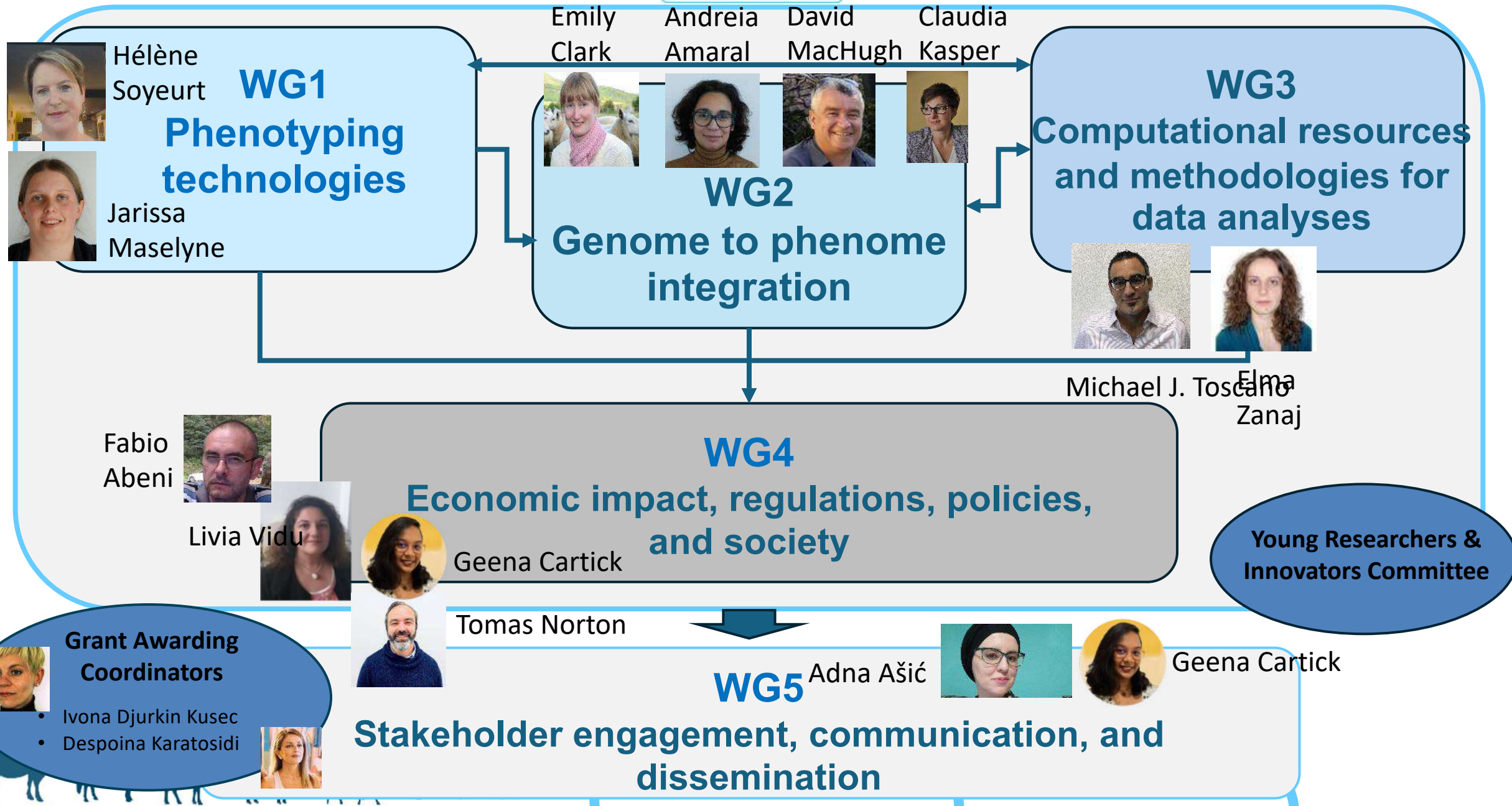
E-mail: tomas.norton@kuleuven.be

- **5 Working Groups**
- **150 Management Committee members from 36 countries**
- **560 Working Group members from 51 countries**
293 males + 237 females
212 from ITC
279 are YRI



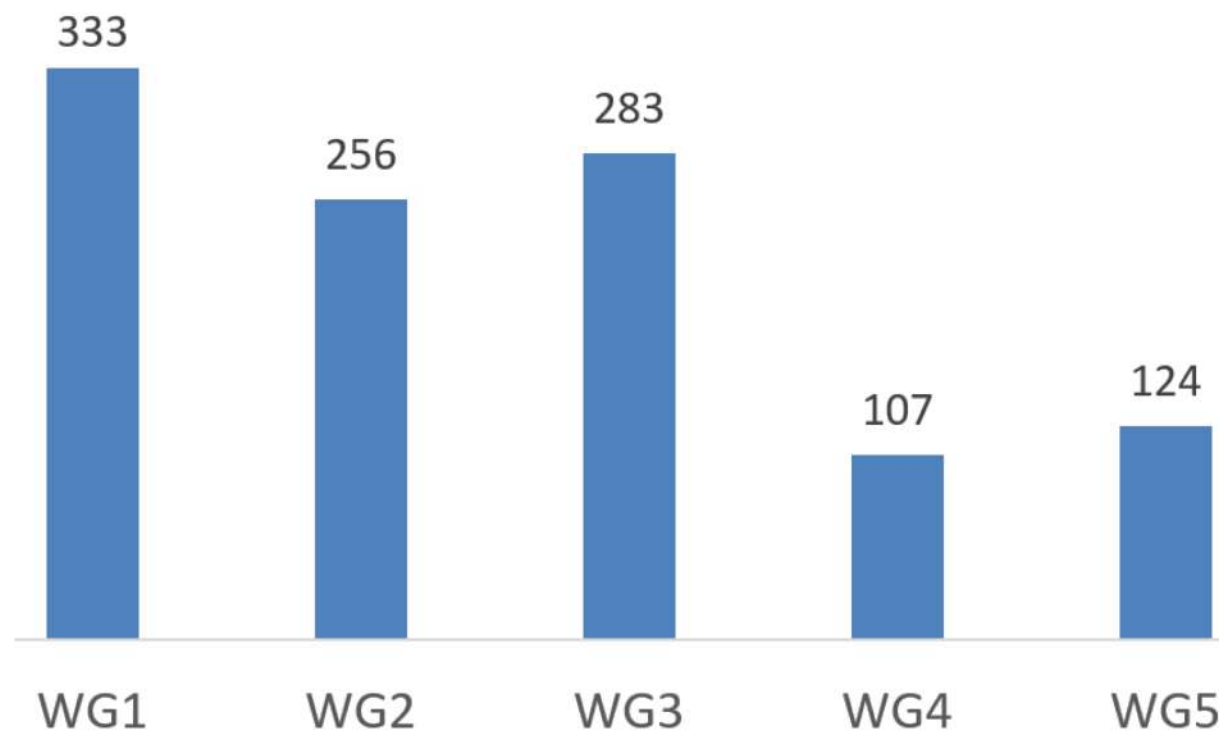
Overview of the CA





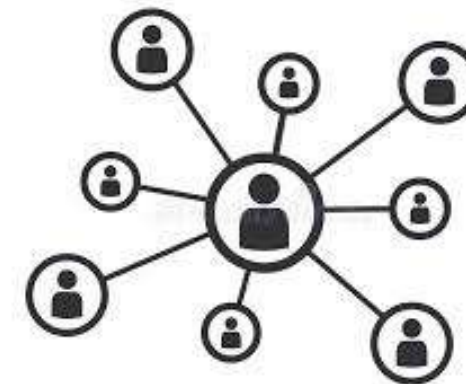
Overview of the CA

Number of Members divided by WG (2026)



EU-LI-PHE Networking tools

- Meetings, Workshops
- Grants to attend third party conferences
- Training schools (WG1-WG4)
- Short Term Scientific Missions (STSMs)
- Virtual mobility grants
- Dissemination activities (social media)



Meetings, workshops
conferences,
and conference grants



Training
schools



Short-term
scientific missions



Dissemination
activities



Virtual networking
grants



WG1. Phenotyping technologies

Main aims:

- i) Provide an overview of current phenotyping technologies and infrastructures that can be used for applications in livestock phenomics;
- ii) Define a roadmap of the research needs to capture high-dimensional phenotypic information on an animal-wide scale.



WG2. Genome to phenome integration

Main aims:

- i) Provide an overview of the links between genome/epigenome variation and phenotypic variation at multiple levels in the main livestock species;
- ii) identify synergies with related initiatives on functional analyses of livestock genomes (e.g., the FAANG initiative);
- iii) identify knowledge gaps and research needs and provide a road map with a clear trajectory to new applications.



WG3. Computational resources and methodologies for data analyses

Main aims:

- i) Provide an overview of the computational models, methods and tools available and current and future needs for development of applications in the context of livestock phenomics;
- ii) identify the needed synergies and developments in terms of cyberinfrastructures and computational capabilities.



WG4. Economic impact, regulations, policies, and society

Main aims:

- i) Provide an overview on the potential technological and economic impact of livestock phenomics;
- ii) Summarise the regulatory frameworks around this discipline and evaluate access to information and data generated;
- iii) Analyse societal perceptions of livestock phenomics. Exchange and collaborations with the other WGs will be essential for the development of the activities in WG4.



WG5. Stakeholder engagement, communication, and dissemination

Main aims:

- i) To ensure a continuous engagement of the stakeholders;
- ii) To ensure overall communication;
- iii) To ensure publication of reviews, reports, **surveys** and establishment of a website and social medias.

**Last chance to take
the Survey!**



Survey: to share with
stakeholders, breeders,
colleagues...



Deliverables

WG	Deliverable no.	Deliverable name	Delivery date - semester=sem	Deliverable no.	Month
1	D1.1	A document/report with a list of phenotyping technologies/approaches that can be used in livestock phenomics	2 nd sem, year 1	1	12
1	D1.2	A document/report with (a) proposal(s) to establish standardization rules and/or systems in livestock phenomics	2 nd sem, year 2	6	24
1	D1.3	A document or report with a list or map of R&D infrastructures in different countries	2 nd sem, year 1	2	12
2	D2.1	A document/report including information of initiatives and projects focused on genome to phenome integration in livestock species. This list is updated regularly every year.	Every year, updated regularly	3	12
2	D2.2	A document/report with (a) proposal(s) to establish genome annotation systems with phenome data and information	2 nd sem, year 2	8	24
2	D2.3	A review on the current and potential applications by integrating genome and phenome information	1 st sem, year 3	10	30
3	D3.1	A document/review including an overview of computational models and methods needed to explore/exploit livestock phenomics	1 st sem, year 2	5	18
3	D3.2	A document/report including proposals to establish standardized databases and computational procedures useful for livestock phenomics	1 st sem, year 3	9	30
3	D3.3	A document/report with information of the existing cyberinfrastructures and computational capabilities available and those needed over the next decades, useful for livestock phenomics	2 nd sem, year 3	11	36
4	D4.1	A report or a review on the expected impacts and applications of livestock phenomics	1 st sem, year 4	14	42
4	D4.2	A review of the regulatory framework including the major issues of concerns in livestock phenomics	1 st sem, year 4	15	42
4	D4.3	A survey structure and a report obtained using the analysed and evaluated data and opinions on livestock phenomics	2 nd sem, year 3	12	36
1, 2, 3, 5	D1.4, D2.4, D3.4, D5.4	A white paper focused on research gaps and priorities in livestock phenomics	2 nd sem, year 4	16	48
5 (1, 2, 3, 4)	D5.1, D5.6	A special themed issue/section of a scientific journal for submission of Action manuscripts and reviews	2 nd sem, year 3 (and every year)	13	36
5	D5.2	A periodic newsletter	Every year	na	-
5	D5.3	A report or document that summarizes the outputs, activities, results and discussions from the stakeholder conference/demonstrations	2 nd sem, year 2	7	24
5	D5.5	An Action website containing scientific and dissemination reports, teaching and training documents, the annual newsletters, announcements and list of scientific articles focused on livestock phenomics and related fields. This list is updated every year.	Every year, updated regularly	4	12
5	D5.7	A book on livestock phenomics that will include basic and advanced chapters to benefit both experts and non-specialists	2 nd sem, year 4	17	48

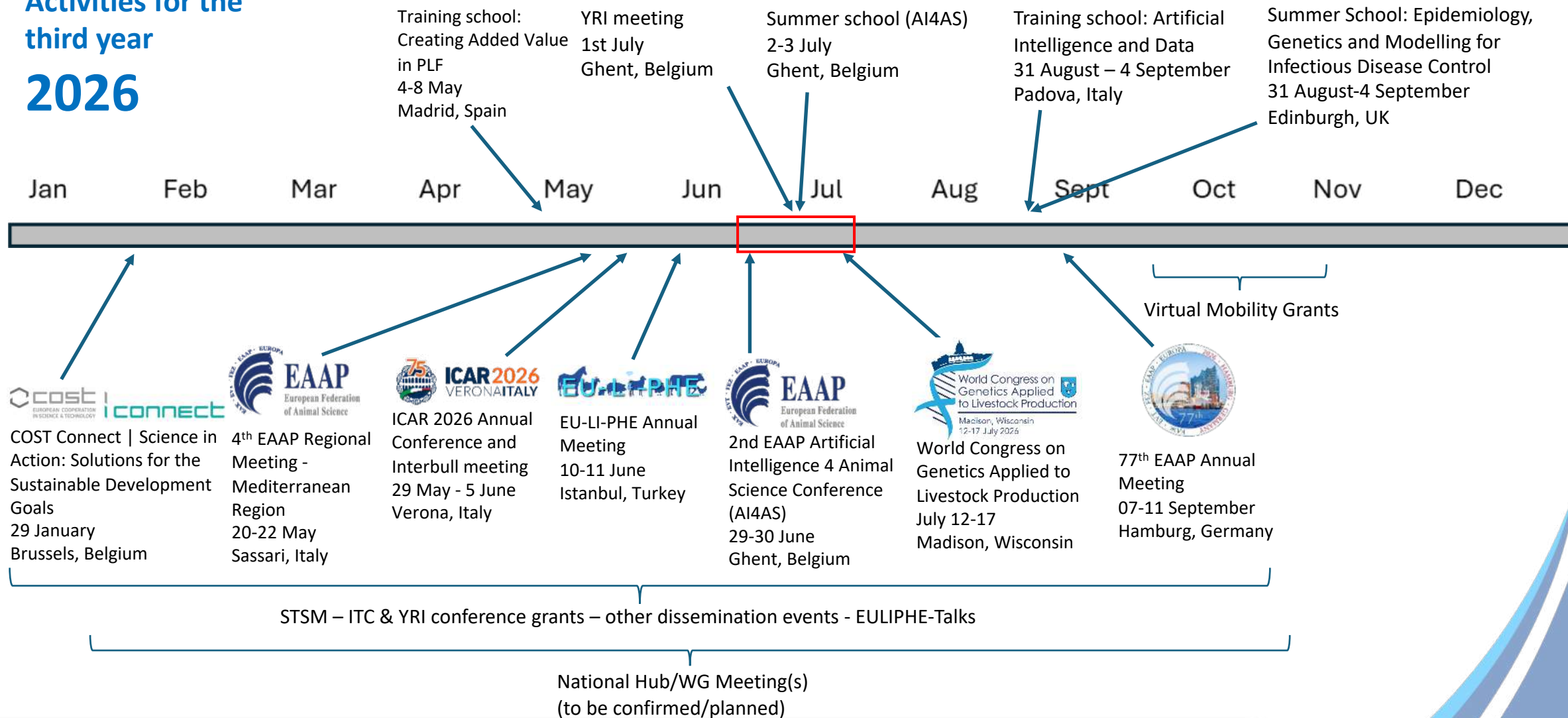
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stakeholders, breeders,
colleagues...



Activities for the third year 2026



Calls open all over the budget period



The poster is framed in blue and features the EU-LI-PHE logo at the top. The main text is in large, bold, pink letters. Below the title, it lists the types of grants available. At the bottom, it includes the European Union flag and the cost logo.

EU-LI-PHE
European Network on Livestock Phenomics

**CALL FOR GRANTS
2026**

**Apply for the STSMs, ITC Conference Grants,
YRI Conference Grants and Dissemination
Conference Grants from EU-LI-PHE 2026
budget.**

 **Funded by
the European Union**

 **cost**
EUROPEAN COOPERATION





September 27th 2023, Kick-off meeting in Brussels



First Annual Meeting: 11-12 June 2024, Bologna, Italy



First EU-LI-PHE Young Researchers & Innovators Meeting – 5th & 6th Sept. 2024, Florence, Italy



Thrid Annual Meeting: 10-11 June 2026, Istanbul, Turkey



WG4 & WG5 Meeting: 25 August 2025, Innsbruck, Austria



Livestock Innovation Event – 20th Sept. 2024 Prague, Czech Republic



Thank you for answering
and sharing the survey!



Survey about phenomics:
to share with stakeholders, breeders, colleagues...



THANK YOU FOR
YOUR ATTENTION

CA22112 - 2023-2027



SCAN TO JOIN US

HOW TO JOIN

Apply to become a
member of the Working Groups:
www.cost.eu/actions/CA22112/



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and sharing the survey!



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to share with stakeholders, breeders,
colleagues...



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Let's Keep in Touch:

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Social media

- LinkedIn
- Facebook
- X

SCAN TO FOLLOW US



Animal and Food Genomics Group @ DISTAL (UNIBO)



L. Fontanesi
PI, Full Professor



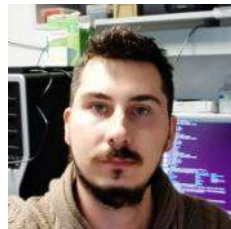
F. Bertolini
Associate Professor



S. Dall'Olio
Associate Professor



P. Zambonelli
Associate Professor



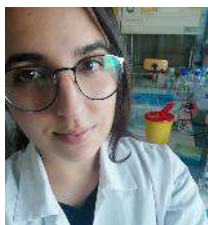
S. Bovo
Assistant Professor



A. Ribani
Assistant Professor



G. Schiavo
Assistant Professor



V. Taurisano
Post doc



S. Agyabeng
PhD Student



M. L. Calabri
PhD Student



**Animal and Food
Genomics Group**



<https://site.unibo.it/animal-and-food-genomics/en>