

CA22112 - 2023-2027



European Network on Livestock Phenomics (EU-LI-PHE): boosting phenotyping in livestock

L. Fontanesi, T. Norton, A. Ašić, E. Clark, I. Djurkin Kušec,
J. Maselyne, H. Soyeurt, M. Toscan



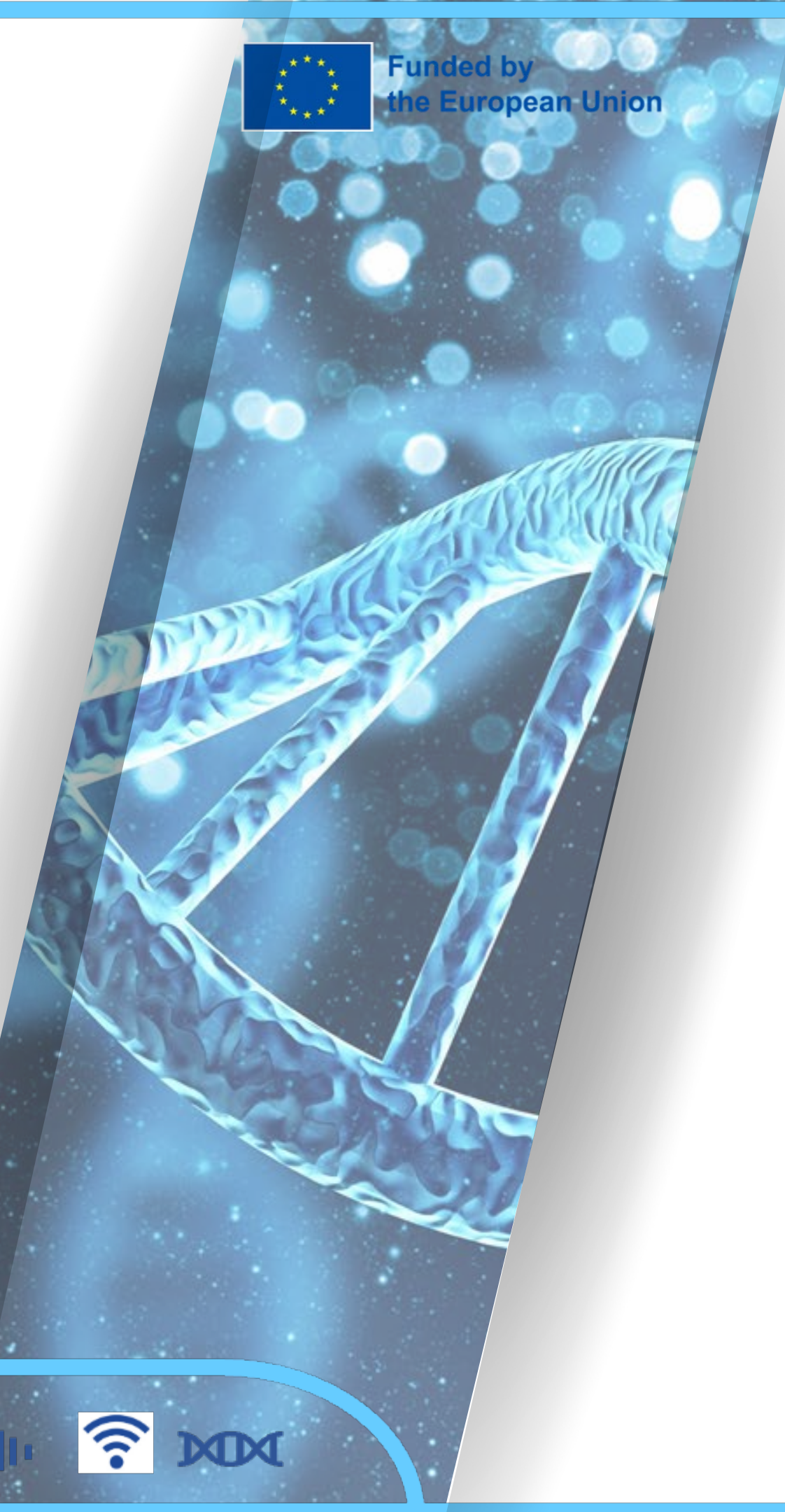
**Funded by
the European Union**

Luca Fontanesi



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

Chair of EU-LI-PHE



Background concepts (I)

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



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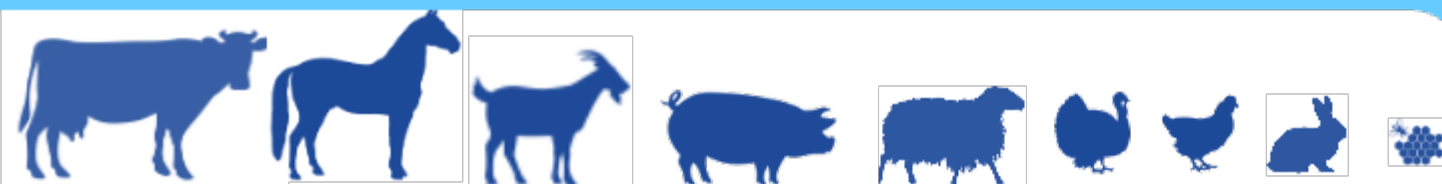
We need:

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



Background concepts (II)

- 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.**



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

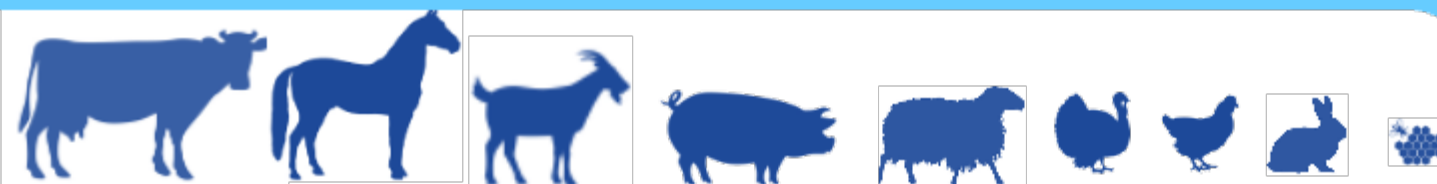
The physical and molecular traits of an animal.



Classification of the phenotypes

Animal phenotypes can be classified in different ways:

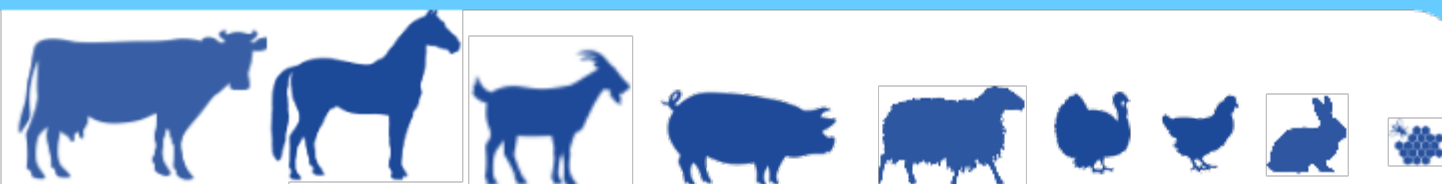
- 1) according to the level in which they are measured (e.g., cell, tissue, organ, or whole organism);**
- 2) the type of information that is recorded;**
- 3) the temporal acquisition of the information (e.g., a single event, a continuous event, or a combination of events);**
- 4) the objective of the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

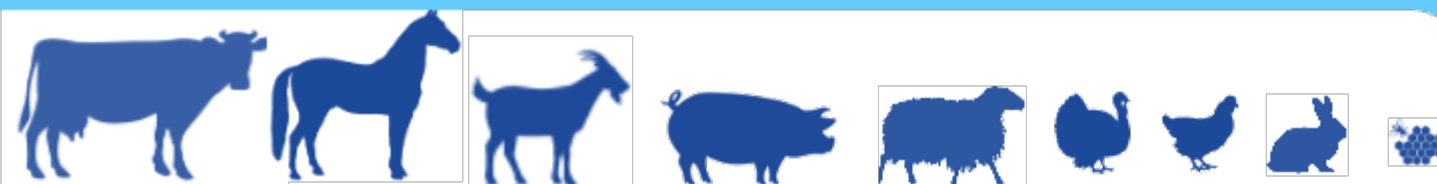


Classification of the phenotypes

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**)

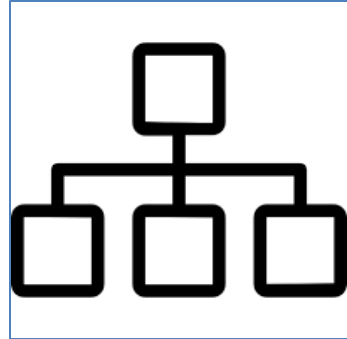
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Research Coordination objectives (II)

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**).

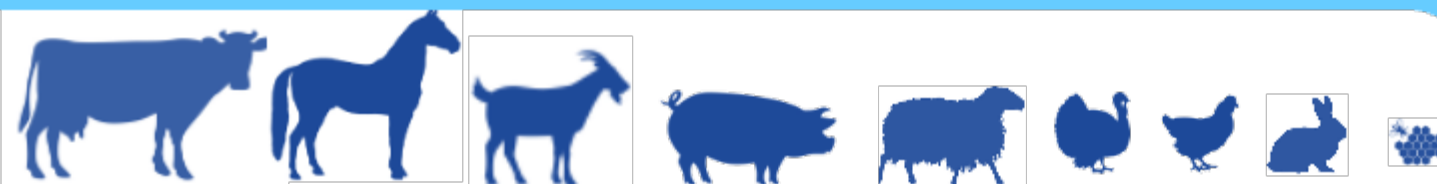
Capacity Building objectives

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.

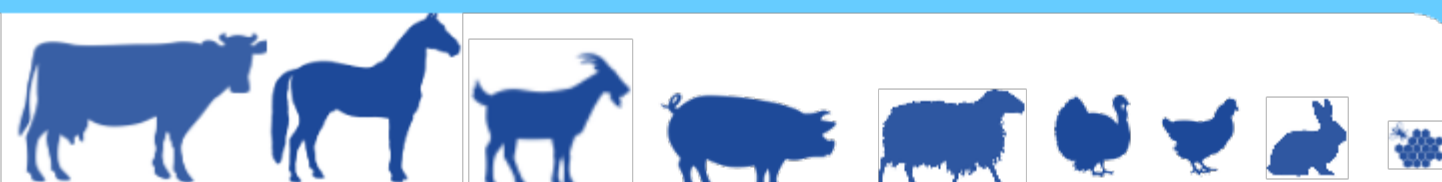


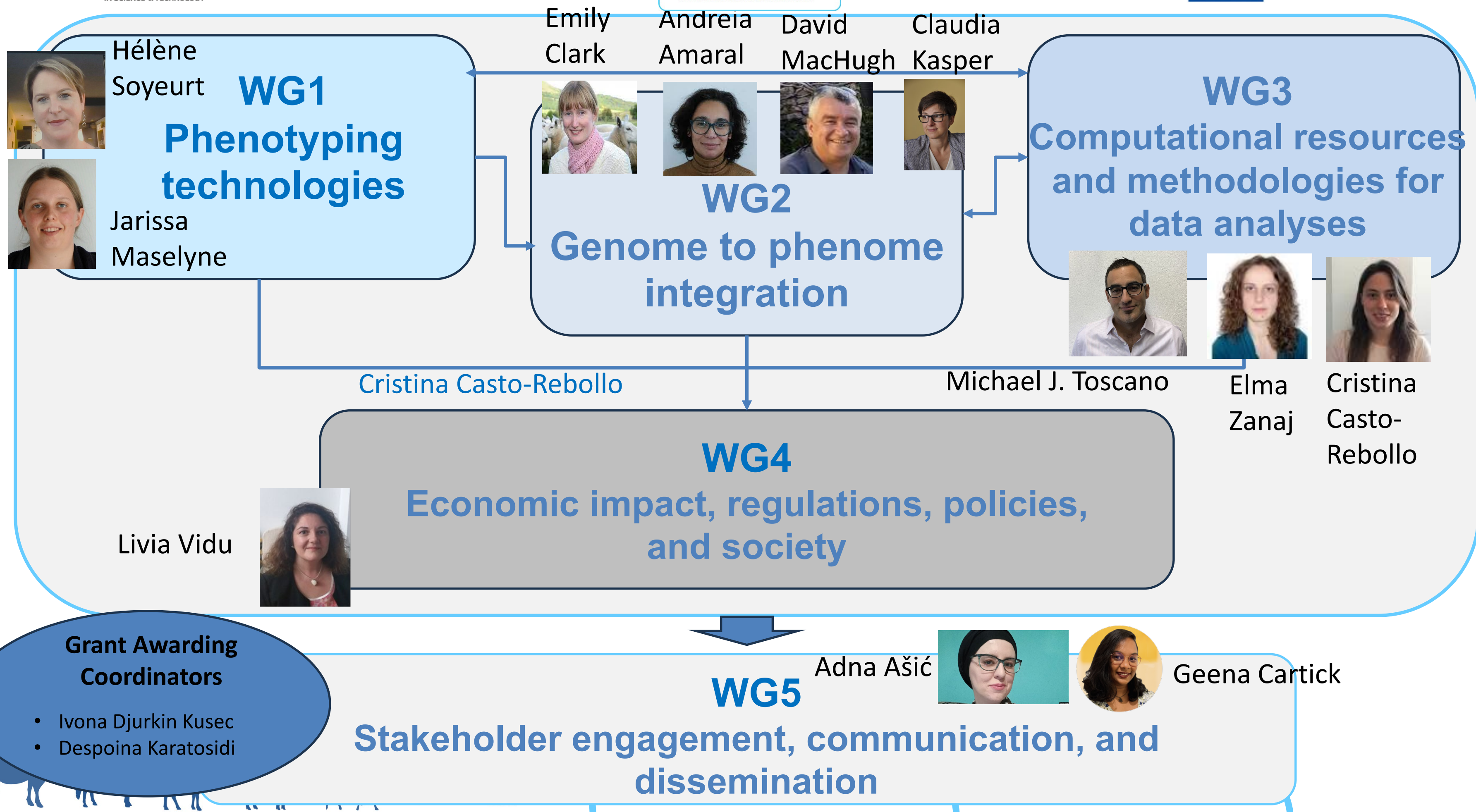
Structure

- Chair: Prof. Luca Fontanesi
- Vice Chair: Prof. Tomas Norton
- **63** Management Committee members from **35** countries
- **360** Working Group members from **50** countries
 - 202 males + 158 females**
 - 136 from ITC**
 - 186 are YRI**

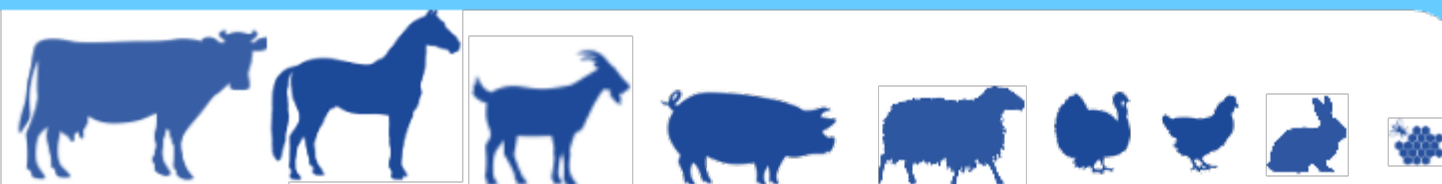
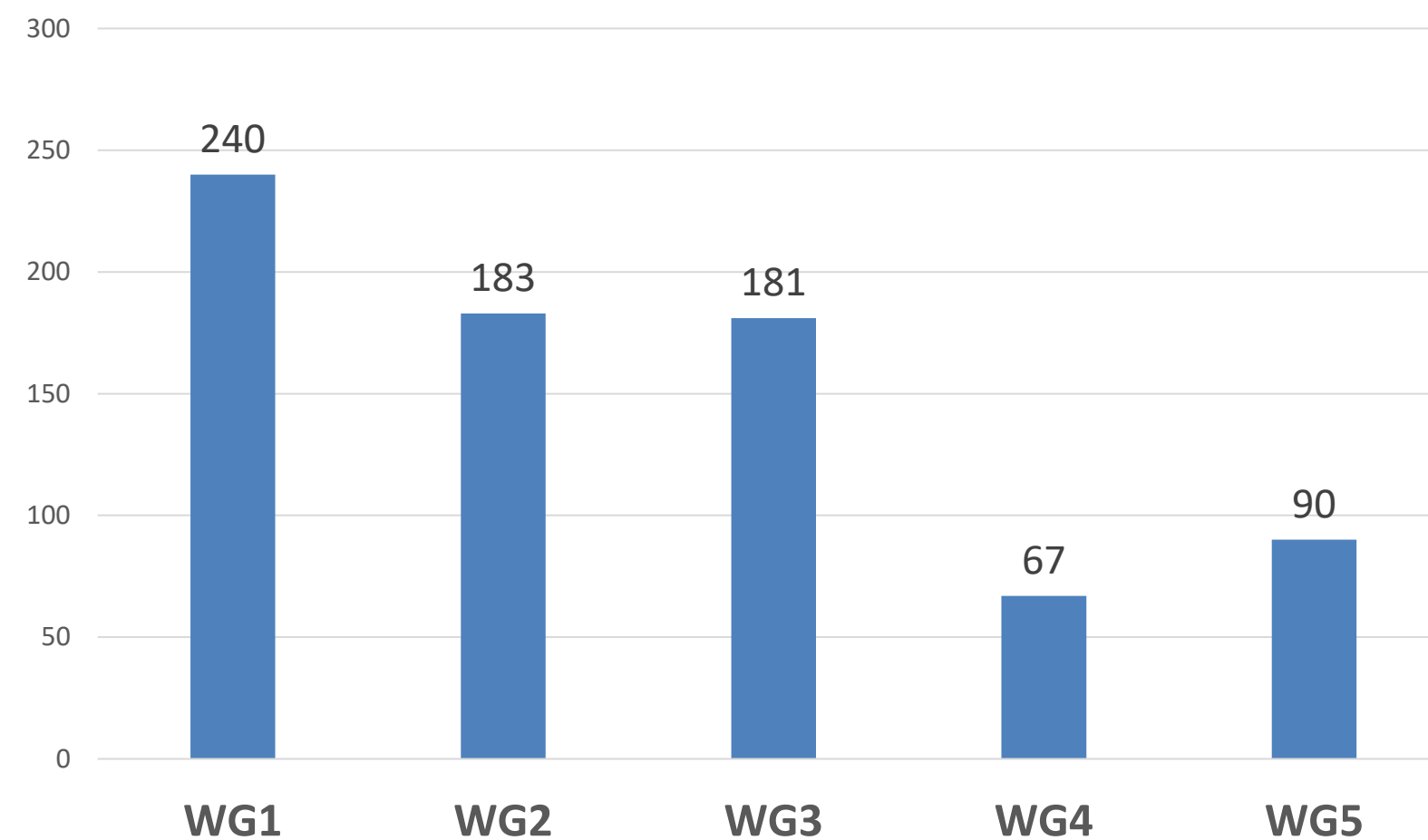


360 WG Members from 50 countries (01/09/2024)



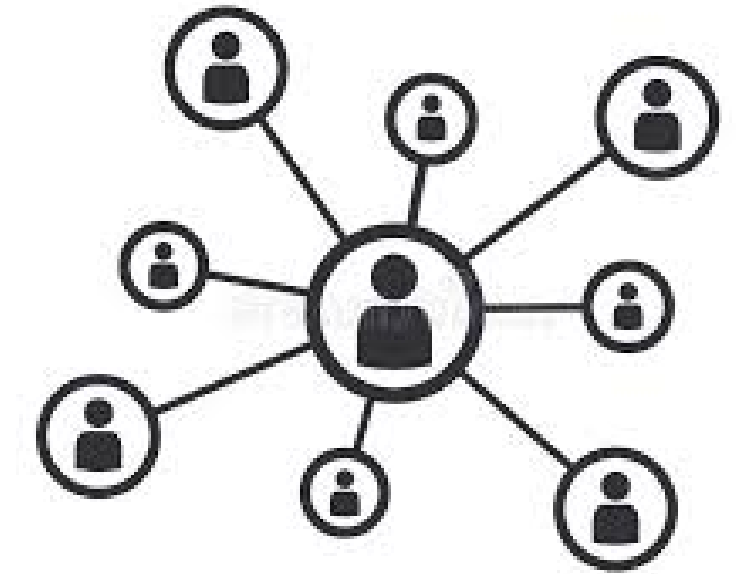


Number of Members divided by WG (01/09/2024)



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



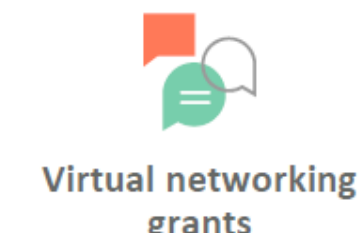
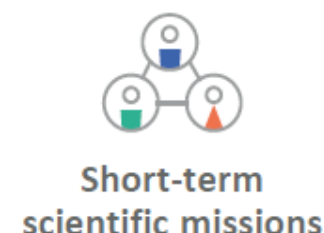
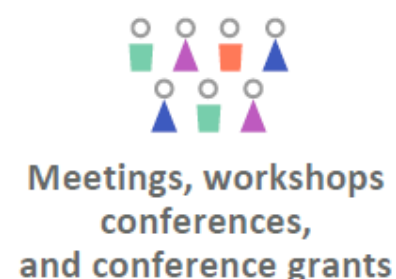
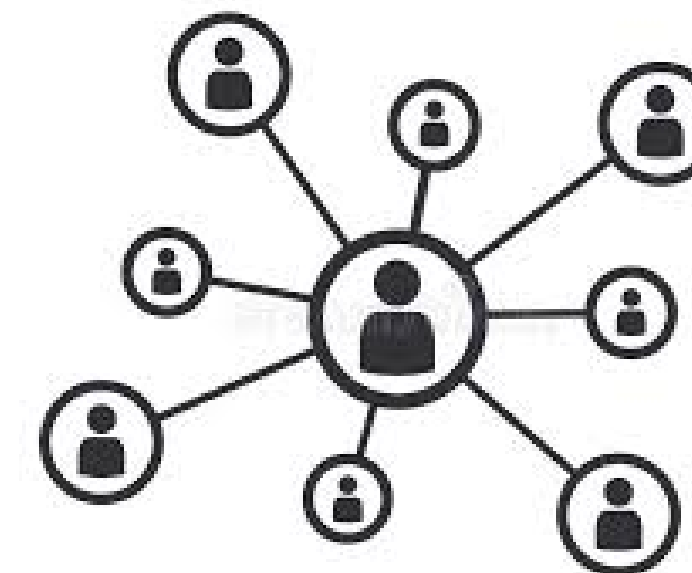
Dissemination
activities



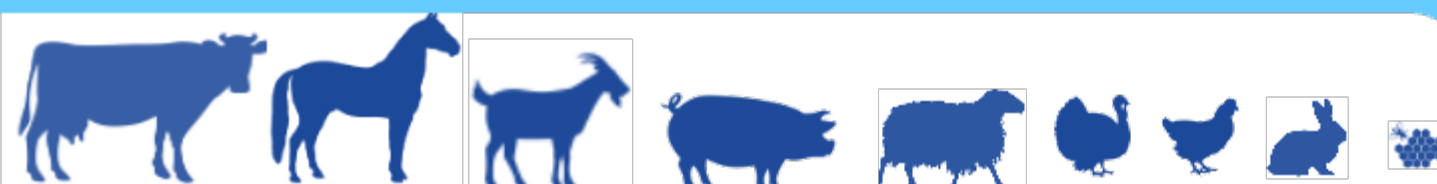
Virtual networking
grants

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)



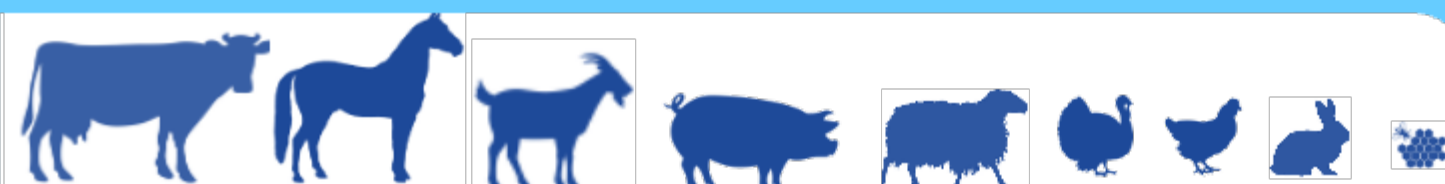
- Job placement/announcement service
- Midterm stakeholder meeting
- Support service from the Enterprise Europe Network (EEN)
- Demonstration activities



Short Term Scientific Missions (STSMs)



The screenshot shows the COST website header with navigation links: COST Actions, Funding, COST Academy, and About. It also includes search, e-COST, and menu icons. The main banner reads "Grants available with the European Network on Livestock Phenomics". Below the banner is a breadcrumb trail: Home > Events > Grants available with the European Network on Livestock Phenomics. The sidebar features the EU-LI-PHE logo and a date range: March 25, 2024 00:00 - October 31, 2024 23:55.



EU- LI- PHE
CA22112



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	D.2.3	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



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.

Task 1.1. Phenotyping technology mapping.

Task 1.2. Standardization of phenotyping systems and information.

Task 1.3. R&D infrastructures.

Task 1.4. Identification of technology gaps and research needs.

Task 1.5. WG1 training school, WG1 meetings and STSM.



WG1. Phenotyping technologies - Deliverables

WG	Deliverable number	Deliverable name	Delivery date - semester=sem	M
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	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	24
1	D1.3	A document/report with a list/map of R&D infrastructures in different countries	2 nd sem, year 1	12
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	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)	36



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.

Task 2.1. Genome biology and phenome differences.

Task 2.2. Expand genome information with phenome data.

Task 2.3. Applications of genome to phenome information.

Task 2.4. Identification of knowledge gaps and research needs.

Task 2.5. WG2 training school, WG2 meetings and STSM.



WG2. Genome to phenome integration - Deliverables

WG	Deliverable number	Deliverable name	Delivery date - semester=sem	M
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 (a document/report and a continuously updated web portal with links to initiatives/projects and case studies)	2 nd sem, year 1	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	24
2	D2.3	A review on the current and potential applications by integrating genome and phenome information	1 st sem, year 3	30
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	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)	36

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.

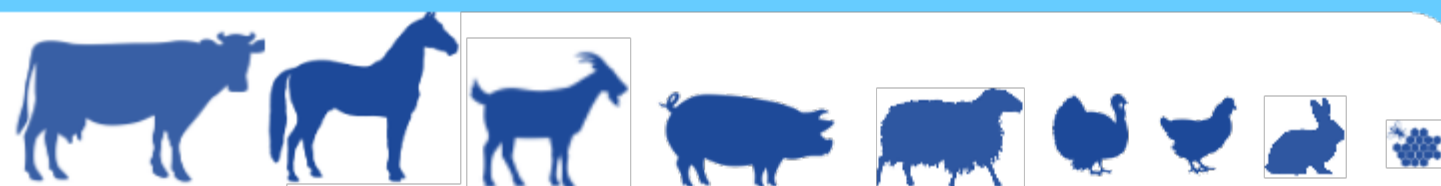
Task 3.1. Development and application of new computational models and methods.

Task 3.2. Definition of data structure, computational standards, formats, and metadata.

Task 3.3. Computational infrastructures and computing capabilities.

Task 3.4. Identification of research needs and bottlenecks.

Task 3.5. WG3 training school, WG3 meetings and STSM.



WG3. Computational resources and methodologies for data analyses - Deliverables

WG	Deliverable number	Deliverable name	Delivery date - semester=sem	M
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	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	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	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	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)	36

WG4. Economic impact, regulations, policies, and society

Main aims:

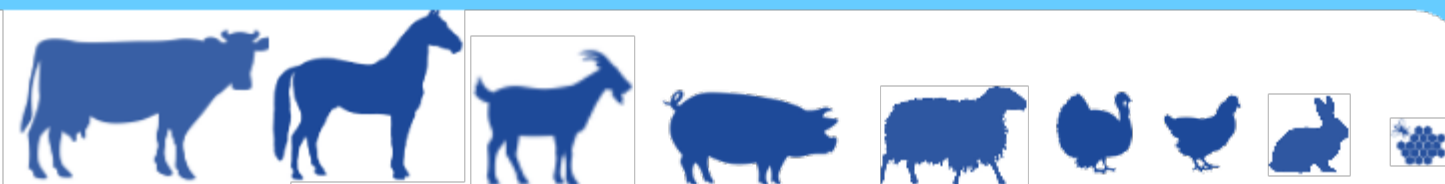
- i) Provide an overview on the potential technological and economic impact of livestock phenomics;
- ii) Summarise the regulatory frameworks around this discipline and evaluate access to information and data generated;
- iii) Analyse societal perceptions of livestock phenomics. Exchange and collaborations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

Task 4.1. Impact analysis.

Task 4.2. Ownership of the data, regulations, and policies.

Task 4.3. Society: societal perceptions and consumer opinions.

Task 4.4. WG4 training school, WG4 meetings and STSM.



WG4. Economic impact, regulations, policies, and society - Deliverables

WG	Deliverable number	Deliverable name	Delivery date - semester=sem	M
4	D4.1	A report or a review on the expected impacts and applications of livestock phenomics	1 st sem, year 4	42
4	D4.2	A review of the regulatory framework including the major issues of concerns in livestock phenomics	1 st sem, year 4	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	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	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)	36



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.

Task 5.1. Stakeholder engagement and job announcement/search service.

Task 5.2. Communication and dissemination.



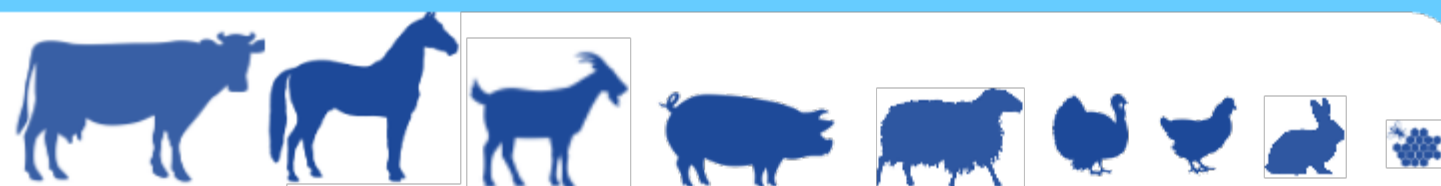
WG5. Stakeholder engagement, communication, and dissemination - Deliverables

WG	Deliverable number	Deliverable name	Delivery date - semester=sem	M
5	D5.2	A periodic newsletter	Every year	-
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	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	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	48
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	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)	36

Scientific Committee Recommendations

To comply with the COST Excellence and Inclusiveness Policy, in the implementation of the Action:

1. The level of involvement of **Inclusiveness Target Countries (ITCs)** should be maintained and a plan should be developed and implemented to ensure the full involvement of ITC representatives in all aspects of the Action's implementation (including in Action leadership positions);
2. The level of involvement of **Young Researcher and Innovators (YRIs)** should be increased and a plan should be developed and implemented to ensure the full involvement of YRIs in all aspects of the Action's implementation (including in Action leadership positions);
3. The **gender balance** should be improved and a plan should be developed and implemented to ensure gender balance in all aspects of the Action's implementation (including in Action leadership positions).



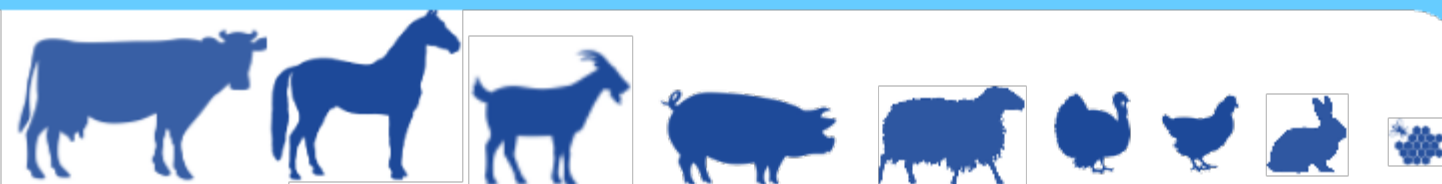


ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA

DEPARTMENT
OF AGRICULTURAL
AND FOOD SCIENCES



First Annual Meeting: 11-12 June 2024



EU- LI- PHE
CA22112



WG1 Training School: 18-21 June 2024

Phenotyping technologies in animals

ILVO

Flanders Research Institute for
Agriculture, Fisheries and Food

ILVO (Merelbeke, Belgium)

 Co-funded by the
Erasmus+ Programme
of the European Union

SAVE THE DATE!

 **EU-LI-PHE**
EUROPEAN NETWORK ON LIVESTOCK PHENOMICS

**TRAINING SCHOOL: PHENOTYPING
TECHNOLOGIES**

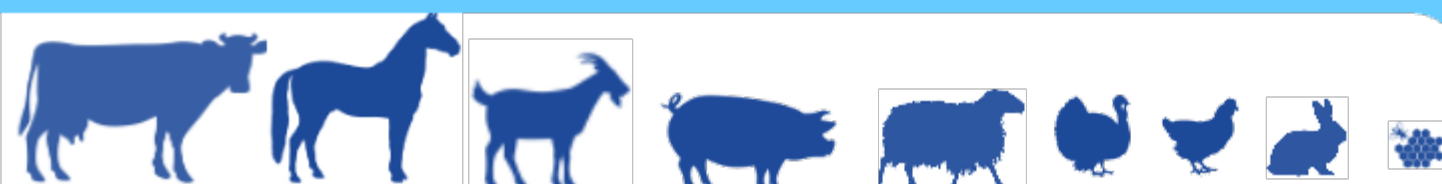
Organized by the COST Action
CA22112 European Network on
Livestock Phenomics, EU-LI-PHE

 **June 18-21, 2024**

 **ILVO, Merelbeke
Belgium**

 **Applications will open on April 8, 2024!**





EU-LI-PHE Young Researchers and Innovators Meeting – Florence, 5-6 Sept. 2024

Final program

Venue:
University of Florence Buildings

Day 1: 5th of Sept. 2024

Room 004, Plesso C9, Via Sandro Pertini 16, Firenze (Italy)

14.00-14.10: Welcome and introduction * (Luca Fontanesi and YRI Committee Leaders)

14.10-14.30: Quick round table *

14.25-15.00: *Lecture on EU funding opportunities – and Q&A ** (Luca Fontanesi)

15.00-15.30: *How to develop leadership and communication skills in COST Actions – and Q&A ** (Adna Asic)

15.30-16.00: Coffee break

16.00-17.45: Group Activities

Group 1: EU-LI-PHE newsletters (Discussion leader: Patricia Ask-Gullstrand)

Group 2: EU-LI-PHE Webinars (Discussion leader: Agostina Zubiri Gaitán)

Group 3: EU-LI-PHE job announcement design (Discussion leader: Iulia Blaj)

17.45-18.00: Final Report of Day 1 – detailed definition of Day 2 program

20.00-22.30: Dinner Together

Day 2: 6th of Sept. 2024

Room 1.03, Plesso D4, Via delle Pandette 32, Firenze (Italy)

09.00-10.30: Group Activity - WG1 deliverables preparation

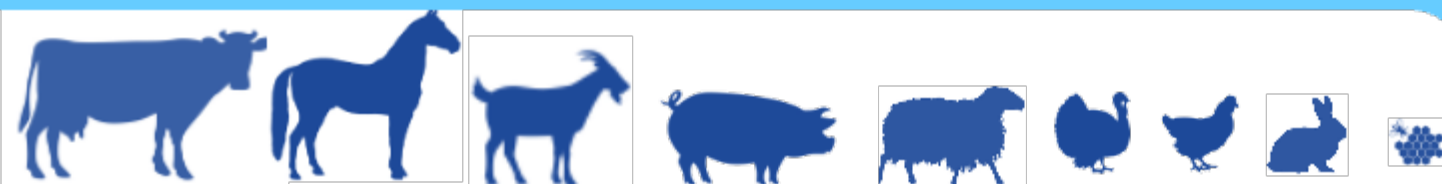
10.30-11.00: Coffee break

11.00-12.30: Group Activities

Preliminary structure of the book on livestock phenomics

Discussion on Topics of Day 1

12.30-13.00: Final report of the meeting & closure



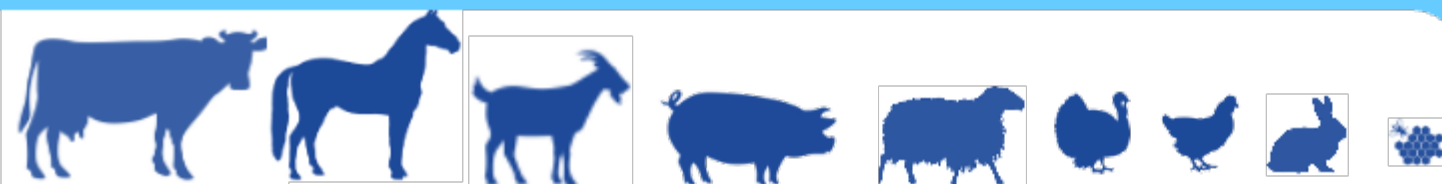
HOW TO JOIN



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



SCAN TO JOIN US





Lets Keep in Touch:
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luca.fontanesi@unibo.it
tomas.norton@kuleuven.be



SCAN TO FOLLOW US



CA22112 - 2023-2027



European Network on Livestock Phenomics (EU-LI-PHE): boosting phenotyping in livestock

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