



RESEARCH & INNOVATION ANALYSIS REPORT

SCAR SAP CWG

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According to the tender specifications, this report provides an overview of a group of selected projects and an explanation of why they may be key to the objectives of the WG. In the analytical part, the projects are analysed in view of a set of 3 criteria:

- (1) outstanding scientific and practical results,
- (2) excellent co-creation of the research objectives and the research work from the start-up until the final outputs, and
- (3) excellent European collaboration or an excellent local/regional place-based innovative approach.

Finally, the report summarises the gaps and overlaps between the projects and in relation to the chosen theme.

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Abbreviations

AH&W	Animal Health and Welfare
CWG	Collaborative Working Group
EC	European Commission
EU	European Union
R&I	Research and Innovation
SAP	Sustainable Animal Production
SCAR	Standing Committee on Agricultural Research
SusAn	Sustainable Animal Production Systems
CSRIA	Common Strategic Research and Innovation Agenda
TST	Thematic Support Team

1. Introduction

1.1 Background

The **Standing Committee on Agricultural Research (SCAR)** is an international multi-stakeholder network, chaired and financed by the European Commission. The SCAR aims to enhance cooperation, coordination and information exchange between the Member States regarding a European Research Area which includes agriculture, fisheries, food, forestry, and bioeconomy. This committee is the result of a coordinated action of thematic Working Groups, which work directly with European projects and national research programmes.

The **SCAR Sustainable Animal Production Collaborative Working Group (SCAR SAP CWG)** provides advice on the coordination of Research and Innovation (R&I) for the development of more sustainable animal production systems in Europe to Member States, Associated Countries and the European Commission. The specific objectives of this CWG are i) Facilitating and stimulating collaboration and networking. ii) Building an evidence-based shared perspective and a common vision for the development of a more sustainable animal production in Europe. iii) Supporting investment in R&I by translating identified challenges into operational instruments while avoiding overlaps with past and current, national and international initiatives, thus optimising resource investment.

1.2 Aims and scope

In October 2022, the CWG SAP organised a workshop to gain insights into the future of European livestock production from a holistic perspective. The workshop was very successful but a great deal of work still needs to be done. In 2023, the CWG SAP is planning to organise a second workshop to continue working in the same direction, **aiming to have a joint approach (understanding and strategy) to develop sustainable livestock farming in Europe.**

The **outcome of this Portfolio Analysis** may contribute to the **success and efficiency of the workshop, which is planned to be held in autumn 2023.** Therefore, the SAP TST will provide the CWG with a detailed Portfolio Analysis on the topic “Future of sustainable animal production in Europe from a holistic perspective”, looking at the projects that have been funded in the past 10 years, and highlighting gaps and overlaps among them.

The specific objectives of this Portfolio Analysis are:

- The identification of **EU-funded R&I projects** (Horizon2020 and beyond), focused on areas and gaps for sustainable animal production;
- The outlining of **major R&I needs** for future-proof animal production systems.

1.3 Methodology

This study was performed by the TST SAP, based on recent and representative **EU funded R&I projects.**

Specifically, four research steps were carried out:

- I. **Projects Mapping (*purposeful sampling*):** selection of **27 EU funded R&I projects** directly related to animal production, and which aim at improving sustainability in the sector. The selection was validated by the EU and can be found on the CORDIS website.
- II. **Projects overview analysis and synthesis (*quali-quantitative methods*):** identification of R&I projects' relevant characteristics, achievements, and gaps. Also, practical data (i.e. contact details, contract number, partners, etc.) were obtained from each project.
- III. **Project cases selection and analysis:** identification and in-depth thematic analysis of **10 illustrative project cases** in the sustainable animal production focus areas. The 10 projects were selected according to the CWG's main interests (i.e. topics discussed during the workshop of 2020, provided keywords, etc.)
- IV. **Data gathering, elaboration, and narrative synthesis** towards the identification of relevant R&I needs and contributing to the **future of sustainable animal production in Europe**.

This **R&I analysis report is the results of the research findings discussed and enriched among TST members**, according to the CWG main objectives. In addition, the sharing and discussion of research findings in the previous CWG workshop (October 2022), allowed the TST to receive feedback and opinion of different CWG members and experts in the field, which was taken into account to elaborate this report.

1.4 Strategic approach of SusAn CSRIA

The selection of projects as well as the analysis of gaps and overlaps were performed taking into account the strategic approach to R&I on livestock production systems of SusAN CSRIA which is quoted below:

'...Because a system is more than the sum of its components, in this chapter the thinking and acting in systems is dealt with as an entity. Moreover, the effect of changing system components needs to be assessed at the system level. Most importantly, the changing of system components requires a vision towards which the system should be developed, and it requires measurable targets.

The strategic approach comprises five areas that can be used together as a strategy for R&I on livestock production systems (see Figure 1):

Area 1: Develop a shared vision of European livestock production.

Area 2: Design livestock production systems.

Area 3: Support the implementation of sustainable systems.

Area 4: Evaluate system performance.

Area 5: Facilitate collective action.

The areas can be regarded as steps that need to be followed in chronological order, as well as areas that are dependent on mutual feedback. The circular design also enables choices to be reconsidered for this strategy and allows it to be adapted over time.”

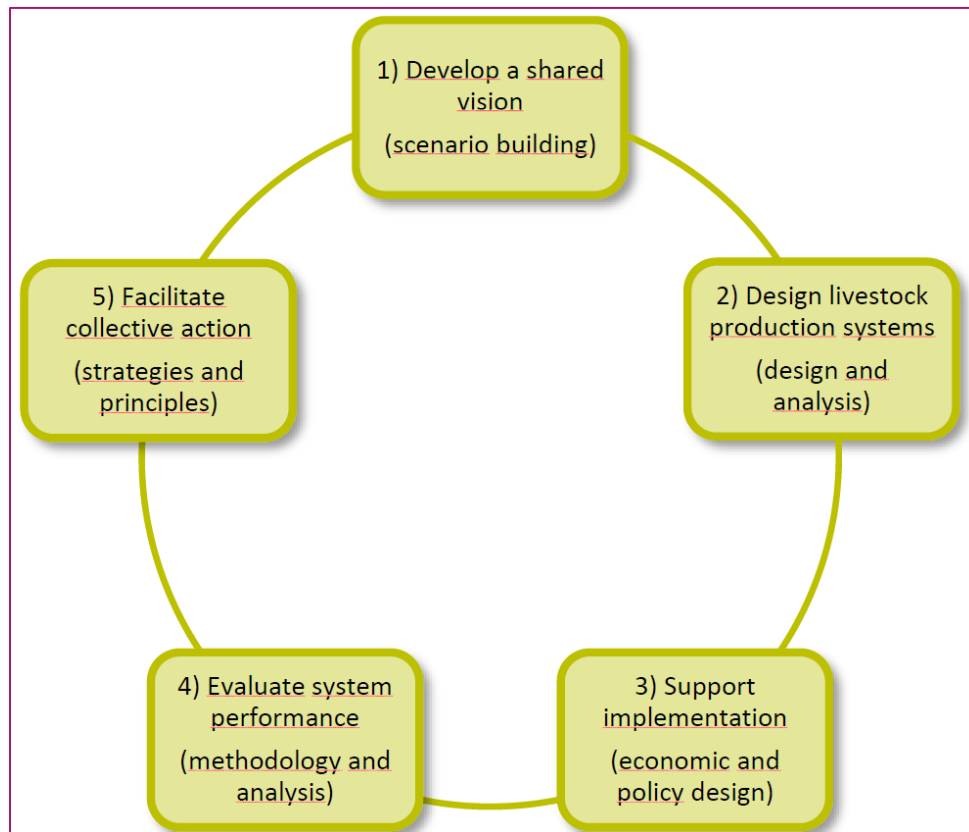


Figure 1. Strategic approach to research and innovation in livestock production. Taken from the SusAn CSRIA Executive agenda 2022. For more information: <https://www.era-susan.eu>

2. Selection of the relevant projects

2.1 Selection of the 27 projects

The projects' mining activity was based on a selection of **keywords** identified by the TST CWG and validated by the CWG, in order to gather sustainable livestock production **initiatives**.

Therefore, the relevant projects could be chosen based on the following **keywords**:

1. **Livestock farming**
2. **Sustainable farming/husbandry animal production**
3. **Organic/livestock farming**
4. **Climate change/livestock**

The keywords were used to browse the most **reliable, updated, and comprehensive databases** for EU-funded R&I projects. All projects could be found in the CORDIS (<https://cordis.europa.eu/en>) database.

Other selection criteria were:

- The working period of the projects was 10 years (2016-2026).
- European projects (H2020, Interreg) that have at least 3 years of performance, so they have already some results to analyse.

Additionally, the EU Commission (Valerio Abadessa) provided the TST CWG with a list of 40 H2020 projects dealing with SAP to speed up the process.

Projects dealing with animal health and welfare were not included in the selection because they overlap with the scope of the AH&W CWG of SCAR. However, some projects that inevitably include common aspects of AH&W and SAP (i.e. PPILLOW and ClearFarm) were considered and analysed. Finally, twenty-seven projects have been identified and selected to be part of the long list of projects (see annex B – Excel sheet)

2.2 Selection of the 10 projects

Within the twenty-seven projects sample, a **purposive selection of ten relevant R&I projects** was made by the TST CWG, in order to gather **illustrative examples** of SusAn CSRIA thematic areas and activities in terms of both faced topics and actions. Specifically, projects were selected according to the following **co-identified qualitative criteria from the Tender specification**:

- 1) outstanding scientific and practical results,
- 2) excellent co-creation of the research objectives and the research work from the start-up until the final outputs, and

3) excellent European collaboration or an excellent local/regional place-based innovative approach

The 10 projects were selected considering the necessity to create a mapping where all the SusAn CSRIA focus areas were illustrated at least by one project. As a result, Table 1 shows a **summary of the 10 projects' final selection**, including their title and acronym, together with their main R&I goal.

Table 1. Mapping of the 10 R&I projects

Title	Acronym	Main R&I goal
Adapting the feed, the animal and the feeding techniques to improve the efficiency and sustainability of monogastric livestock production systems	Feed-a-Gene MA	Alternative feed resources and technologies / Monogastric livestock production
A Europe-wide thematic network supporting a sustainable future for EU dairy farmers	EuroDairy MA	Economic, social and environmental sustainability of dairy farming in Europe
Innovation for sustainable sheep and goat production in Europe	iSAGE MA	Sustainability, competitiveness and resilience of the European Sheep and Goat sectors
EU pig innovation group	EU PiG MA	Competitiveness of the European pig industry
Organic knowledge network on monogastric animal feed	OK-Net, EcoFeed MA	100% use of organic and regional feed for monogastrics
Innovative nutrient recovery from secondary sources – Production of high-added value FERTILISERS from animal MANURE	FERTIMANURE	Manure produced by livestock farms / Fertilisation
Co-designed Welfare Monitoring Platform for Pig and Dairy Cattle	ClearFarm	Precision-livestock farming technologies and integration of animal-based data
Poultry and Pig Low-input and Organic production systems' Welfare	PPILOW MA	Poultry and Pig organic and low-input outdoor farming
Innovative tools for assessment and authentication of chicken meat, beef and dairy products' qualities	INTAQT MA	Relationship between husbandry systems and intrinsic quality traits of animal-sourced products
Pathways for transitions to sustainability in livestock husbandry and food systems	Pathways MA	Livestock / circular bioeconomy

Specifically, the 10 projects were selected according to the theme (future of livestock in Europe) and keywords (livestock farming, sustainable farming/husbandry animal production, organic/livestock farming, climate change/livestock), previously agreed with the CWG. Overall, all projects aim to improve the **holistic sustainability of the livestock sector**, from economic, social and environmental perspectives, considering innovation, and resilience as key factors.

Besides, we sought **complementarity between the selected projects**. Thus, some projects involve different livestock species (bovine, sheep, goat, pigs, chicken) and have into account **diversity** - such as breeding strategies; extensive and intensive systems-. One of the projects focuses on the **usage of manure for fertilization** (circularity and climate change). The remaining projects promote **ecological and organic production**. **New technologies** are also involved; thus, some projects assess innovative tools for precision livestock farming.

3. Overlaps and gaps analysis

The 10 selected projects were mapped in the light of illustrated SusAn CSRIA focus areas. Each project includes data related to one or more of the SusAn CSRIA thematic areas (Table 2).

Table 2. SusAn CSRIA thematic areas included in each of the 10 selected projects.

Acronym	+	-
Feed-a-Gene MA	2	
EuroDairy MA	1,3,5	
iSAGE MA		1, 5
EU PiG MA	1, 2, 4, 5	
OK-Net, EcoFeed MA		1
FERTIMANURE	2, 3	
ClearFarm	2, 3	
PPILOW MA	2, 3	
INTAQT MA	5	
Pathways MA	1	

The numbers indicate the different SusAn CSRIA thematic areas: 1. Develop a shared vision of European livestock production; 2. Design livestock production systems; 3. Support implementation of sustainable systems; 4. Evaluate system performance; 5. Facilitate collective action. + and -: More and less developed areas for the proposed project, respectively.

Overlaps:

- ✿ 5/10 projects represent a common vision of European livestock production (thematic area 1). However, others such as the iSAGE project claims to consider the special characteristics that each country offers.
- ✿ 5/10 projects involve new designs for livestock production systems (thematic area 2).
- ✿ 4/10 projects directly address the need of implementing sustainable systems (thematic area 3),
- ✿ 1/10 projects assess systems performance (thematic area 4), and the implementation of a multi-actor platform to ensure dialogue among all parts of the production chain (from farmers, researchers, vets, to consumers).

- ✿ 4/10 projects directly involve the facilitation of collective action (thematic area 5).

Gaps:

- ✿ Lack of specific regional data within Europe on the needs and sources of each country.
- ✿ Lack of consensus on how to achieve organic farming in Europe (management, price, etc.), despite its importance for the future of sustainable livestock.
- ✿ Few projects contained the approach of resilience and diversity to achieve sustainability. To preserve and enhance biodiversity is a major challenge for European livestock production according to SusAn CSRIA.
- ✿ Few projects are willing to include new technologies such as 'precision-livestock farming technologies' as a way to gain competitiveness in the European food and agroecology sectors.
- ✿ Lack of projects related to GHG emissions: to restrict emission losses is a major challenge for European livestock production according to SusAn CSRIA.
- ✿ 4/10 projects address the importance of supporting rural areas. Maintenance of depopulated rural areas, promoting employment and sustainable opportunities is also a major challenge for European livestock production according to SusAn CSRIA.

4. R&I needs analysis

As part of this work, overall **R&I needs were identified considering the components of livestock production systems determined by SusAn CSRIA**. These components can be divided into two parts:

- 1) political and socio-economic system components, and
- 2) agricultural and technical system components.

All components are seen as tools or means, *i.e.* "adjusting screws" to optimize system performance, and, consequently, to meet the challenges of European livestock production. They are further divided as listed below.

Political and socio-economic system components

- ✿ » Governance and public policy
- ✿ » Market and prices
- ✿ » Consumption patterns and food waste
- ✿ » Working conditions

Agricultural and technical system components

- ✿ » Animal nutrition
- ✿ » Breeding / genetics
- ✿ » Animal housing
- ✿ » Manure management incl. biogas
- ✿ » Animal health and welfare management
- ✿ » ICT, robotics and Big Data

Considering the 10 selected projects, their coverage regarding R&I topics (section 3. Overlaps and gaps analysis), and the different SusAn CSRIA thematic areas, **the need for further research and innovation efforts emerges regarding the following points:**

1) Action from a political perspective.

- i) Market price should be regulated, considering inflation (COVID, geopolitical situation, etc.), and the trend towards a more organic system (which is more expensive).
- ii) New legislation regarding food waste and circular economy to warrant sustainability.
- iii) Better working conditions, especially in rural areas, to stop rural depopulation.

2) Action from a technical perspective.

- i) Future research should focus on multidisciplinary approaches with a common objective: improving sustainability of European livestock. Hence, genetic breeding, new technologies, and manure/animal health and welfare management should be at the forefront of the upcoming funded European research projects.

5. Concluding remarks

This report may help to build on the development of a new strategic research and innovation agenda. By the adoption of an innovative co-designed portfolio analysis methodology, this research led to: i.) the identification of relevant EU funded R&I projects' achievements and gaps, related to the animal production systems (looking into sustainability from a holistic perspective); and ii.) the outlining of R&I needs for future-proof animal production systems capable to meet the challenges/needs of the SusAn CSRIA criteria.

Accordingly, the presented findings are innovative in:

- 🌱 highlighting the fundamental role that a portfolio analysis can play as an effective methodology for supporting integrative reviews and purposeful investigations of EU-funded R&I projects' characteristics, achievements and gaps, and the consequent co-design of new effective agendas, capable to meet concrete needs of research and action, and favouring an optimization of R&I funding;
- 🌱 identifying a trustable list of R&I topics that should require more efforts from both researchers and policy makers to be investigated and developed in work programmes and projects;

As a result, these actions could become the basis for the planning and implementation of new projects and activities which cover the challenges and needs stated in the SusAn CSRIA report.

Annexes

Annex A – List of 27 R&I projects concerning sustainable animal production

A total of 27 projects were analyzed. Find below the complete list of detected R&I projects

No.	PROJECT TITLE	PROJECT ACRONYM	DATABASE	SELECTED FOR SAMPLING (27)
1	Practice-led innovation supported by science and market-driven actors in the laying hen and other livestock sectors	Hennovation MA	CORDIS (https://cordis.europa.eu/project/id/652638)	0
2	Adapting the feed, the animal and the feeding techniques to improve the efficiency and sustainability of monogastric livestock production systems	Feed-a-Gene MA	CORDIS (https://cordis.europa.eu/project/id/633531)	1
3	Innovation for sustainable sheep and goat production in Europe	iSAGE MA	CORDIS (https://cordis.europa.eu/project/id/679302)	1
4	A Europe-wide thematic network supporting a sustainable future for EU dairy farmers	EuroDairy MA	CORDIS (https://cordis.europa.eu/project/id/696364)	1
5	Data driven dairy decisions 4 farmers	4D4F MA	CORDIS (https://cordis.europa.eu/project/id/696367)	0
6	Shared innovation space for sustainable productivity of grasslands in Europe	Inno4Grass MA	CORDIS (https://cordis.europa.eu/project/id/727368)	0

7	Sharing expertise and experience towards sheep productivity through networking	SheepNet MA	CORDIS (https://cordis.europa.eu/project/id/727895)	0
8	EU pig innovation group	EU PiG MA	CORDIS (https://cordis.europa.eu/project/id/727933)	1
9	Organic knowledge network on monogastric animal feed	OK-Net , EcoFeed MA	CORDIS (https://cordis.europa.eu/project/id/773911)	1
10	Poultry and Pig Low-input and Organic production systems' Welfare	PPILOW MA	<u>CORDIS (https://cordis.europa.eu/project/id/816172)</u>	1
11	Holistic solution to improve animal food production through deconstructing the biomolecular interactions between feed, gut microorganisms and animals in relation to performance parameters	HoloFood	<u>CORDIS (https://cordis.europa.eu/project/id/817729)</u>	0
12	SUStainable INsect CHAIN	SUSINCHAIN	<u>CORDIS (https://cordis.europa.eu/project/id/861976)</u>	0
13	Integrating innovative TECHNOLOGIES along the value Chain to improve small ruminant welfare management	TechCare MA	<u>CORDIS (https://cordis.europa.eu/project/id/862050)</u>	0
14	BovINE Beef Innovation Network Europe	BovINE MA	<u>CORDIS (https://cordis.europa.eu/project/id/862590)</u>	0
15	BIOCONVERSION OF UNDERUTILIZED RESOURCES INTO NEXT GENERATION PROTEINS FOR	NextGenProteins	<u>CORDIS (https://cordis.europa.eu/project/id/862704)</u>	0

	FOOD AND FEED			
16	Innovative nutrient recovery from secondary sources – Production of high-added value FERTIlisers from animal MANURE	FERTIMANURE	CORDIS (https://cordis.europa.eu/project/id/862849)	1
17	Co-designed Welfare Monitoring Platform for Pig and Dairy Cattle	ClearFarm	CORDIS (https://cordis.europa.eu/project/id/862919)	1
18	MICROALGAE PROTEIN INGREDIENTS FOR THE FOOD AND FEED OF THE FUTURE	ProFuture	1CORDIS (https://cordis.europa.eu/project/id/862980)	0
19	European network for interactive and innovative knowledge exchange on animal health and nutrition between the sheep industry actors and stakeholders	EuroSheep MA	CORDIS (https://cordis.europa.eu/project/id/863056)	
20	Consumer-driven demands to reframe farming systems	Code Re-farm MA	CORDIS (https://cordis.europa.eu/project/id/101000216)	0
21	Innovative tools for assessment and authentication of chicken meat, beef and dairy products' qualities	INTAQT MA	CORDIS (https://cordis.europa.eu/project/id/101000250)	1
22	Linking extensive husbandry practices to the intrinsic quality of pork and broiler meat	mEATquality MA	CORDIS (https://cordis.europa.eu/project/id/101000344)	0
23	Pathways for transitions to sustainability in livestock husbandry and food systems	Pathways MA	CORDIS (https://cordis.europa.eu/project/id/101000395)	1

24	Small ruminant technologies – Precision livestock farming and digital technology for small ruminants	SM@RT MA	CORDIS https://cordis.europa.eu/project/id/101000471	0
25	Resilience for dairy	R4D MA	CORDIS (https://cordis.europa.eu/project/id/101000770)	0
26	An infrastructure for experimental research for sustainable pig production	PIGWEB	CORDIS (https://cordis.europa.eu/project/id/730924)	0
27	An integrated infrastructure for increased research capability and innovation in the European cattle sector	SmartCow	CORDIS (https://cordis.europa.eu/project/id/730924)	0

Our elaboration on secondary data. *In the last column: 1 means selected; 0 means not selected

Annex B – Twenty-seven R&I projects database

An Excel file was created for the mapping of the twenty-seven R&I projects sample. The file is included in attachment to this report (see file “[Annex B Excel database \(27 projects\)](#)”).

Annex C – Ten R&I projects' fiches

1) Adapting the feed, the animal and the feeding techniques to improve the efficiency and sustainability of monogastric livestock production systems» – Feed-a-Gene MA



Source(s)

CORDIS (<https://cordis.europa.eu/project/id/633531>)
Project website: <https://www.feed-a-gene.eu/>



Funding details

Source of funding: H2020-EU.3.2. - SOCIETAL CHALLENGES - Food security, sustainable agriculture and forestry, marine, maritime and inland water research, and the bioeconomy
Type of project (+ cluster if relevant): RIA - Research and Innovation action
Contract number: 633531
Project total budget: € 9 615 108,75



Start and end date of the project

01/03/2015 - 29/02/2020



Project summary

Overall, this project aimed to better **adapt the components of pig, poultry, and rabbit production systems to improve the overall efficiency and reduce the environmental impact**. The specific objectives were: 1. Develop **feed technologies to make better use of locally produced feed resources**; 2. Develop methods for the **rapid characterization of the nutritional value of feeds**; 3. Develop **new traits of feed efficiency and robustness** allowing to identify variation among individual animals for use in **breeding strategies**; 4. Develop **new management systems for precision feeding**; 5. Develop biological models to better understand and **predict the nutrient and energy utilization** of animals; 6. **Evaluate** the overall **sustainability of the new management systems** developed by the project; 7. **Demonstrate the innovative technologies** developed by the project in collaboration with the feed industry, breeding companies, equipment manufacturers, and farmers' organisations to promote the **practical implementation** of project results; 8. **Disseminate new technologies** that will increase the efficiency of animal production systems, whilst maintaining product quality and animal welfare and enhance EU food security.

The work was divided in **8 different working packages**: WP1 **Alternative feed ingredients** and real-time characterisation; WP2 **New animal traits for innovative feeding and breeding strategies**; WP3 Modelling **biological functions** with emphasis on **feed use** mechanisms; WP4 Management systems for **precision feeding**; WP5 Use of **traits in animal selection**; WP6 **Sustainability assessment**; WP7 **Dissemination**, training, and technology transfer;

WP8 Project management.

With these objectives, Feed-a-Gene aimed to better adapt different components of monogastric livestock **production systems** (i.e., pigs, poultry, and rabbits) to **improve** the overall **efficiency** and **to reduce the environmental impact**. This involved the development of **new and alternative feed resources and feed technologies**, the **identification and selection of robust animals** that are better adapted to fluctuating conditions, and the development of **feeding techniques** that allow optimizing the potential of the feed and the animal.

Combinations of feed technologies were developed that **improve the nutritional values** of European-grown **soybean meal, rapeseed meal, and protein from green biomass**. These feed resources and technologies favour the protein autonomy and **make Europe a front-runner in using feed resources** that are not or less in competition with other uses.

Indicators of feed efficiency, animal robustness, and welfare (i.e. digestibility, composition and function of gut microbiota, and biomarkers) were **developed and evaluated**, and will facilitate the development of novel traits that can be used in breeding strategies -genetic selection- and in on-farm (feeding) management practices. This contributes to **improve feed efficiency, and reduce feed cost, nutrient excretion, and the associated environmental impact**.

Analytical techniques allowed identifying a **gap** between **consumers' expectations** and **perception of animal production**. These unique insights into the preferences and attitudes of consumers help assessing the innovative potential of the proposed solutions and will help in shaping a better livestock production sector in the future.



Project results

1. Feed technology; alternative feeding ingredients. WP1
2. Methods nutritional value.
3. New traits (breeding strategies). WP2 and WP5
4. New management (precision feeding). WP4
5. Biological models (feeding use). WP2
6. Overall sustainability. WP6
7. Innovative techs.
8. Dissemination. WP7
9. Project management. WP8

This project generated important data that has been summarized and disseminated through the project website, brochures, 5 newsletters, videos (53), social media posts, and scientific publications (39 peer-reviewed papers and 212 communications). Seven demonstration events, 7 stakeholder workshops, and a final stakeholder meeting were also organised. The main results obtained in this projects are summarized below:

On the one hand, alternative sources of proteins have been investigated. Novel technologies were employed to compare **European-grown soybeans** with commercial soybean meal. Both sources of soy provided similar results in pigs and poultry (Tallentire et al., 2018). On the other hand, **fractionation of rapeseed meal (RSM)** into a fine and coarse fraction demonstrated superior pig performance and digestibility of the fine fraction compared with commercial RSM (Bikker et al., 2020). Additionally, protein from **green biomass** may arise as a new sustainable protein source for monogastric animals - improvements in the harvest and precipitation procedures have improved the protein content of the concentrate. However, project data demonstrated that proteins extracted from green biomass were inferior to conventional protein sources and the remaining pulp after extraction of the protein is not

suitable as rabbit feed.

Some conference proceedings showed that the **digestibility and metabolizable energy content** of individual feed ingredients and mixed diets can be predicted by **Near-infrared spectroscopy (NIRS)** with a relatively high precision. **Individual feed intake** in group-housed broilers and rabbits was measured by **prototypes of equipment**; specifically, these prototypes were used to analyze variation in feed intake among animals. Furthermore, new **precision feeding systems** for growing pigs, sows, and poultry have been developed using a modular design and were reported in several conference proceedings. The components of the system include elements such as a decision support system, precision feeding devices, or an electronic controller, which together compose a complete **precision feeding system to work on-farm**. Specifically, sets of pre-industrial precision feeding systems have been manufactured and installed for validation and demonstration activities in farms of growing pigs. Considering that different species have different needs, different **conceptual models** for pigs and poultry were developed to simulate feed use mechanisms, such as digestion and metabolic utilization. Firstly, a **perturbation model** which quantifies animal robustness traits was developed. Secondly, a **stochastic module** was designed to quantify variation in traits among individual animals within a herd. These two models have been integrated in the FeedUtiliGene software that helps to understand the different models and allows their direct use. This software can help in making decisions on genetic selection, feeding strategies, and management of the herd. Additionally, the environmental and economic impacts of the different solutions proposed by the project were assessed by “Life Cycle Assessment” and “Cost Benefit Analysis”.

Research related to microbiota was largely assessed in this project, with several peer-reviewed articles and conference proceedings published on the topic. Specifically, studies were focused on the variation in composition of the intestinal and faecal microbiota in pigs, rabbits, and poultry as affected by diet composition and genotype, and their relationships with nutrient digestion and feed efficiency. Also, promising **breeding traits** (e.g. based on gut microbiota composition, digestive efficiency, robustness and social interactions) have been evaluated in relation to **feed efficiency**. The advantage of using these traits for selection, in combination with genomic and crossbred information, was evaluated. Studies were conducted in pigs and rabbits.

Surveys were conducted to analyze consumer and farmer attitudes towards **improving sustainability of livestock production**. Obtained data were used to construct a composite **index to explore the relative sustainability of feeding solutions for pigs and poultry**. **Analytical techniques** allowed identifying a gap between consumers' expectations and perception of animal production. These unique insights into the preferences and attitudes of consumers help assessing the innovative potential of the proposed solutions and will help in shaping a better livestock production sector in the future by better addressing consumer's expectations in future research projects.

References:

Tallentire CW, Mackenzie SG, Kyriazakis I (2018) Can novel ingredients replace soybeans and reduce the environmental burdens of European livestock systems in the future? Journal of Cleaner Production, 187: 338-347.

Bikker P, Kreis A, Oberholzer T, Royer E, Bach Knudsen KE (2020) Fractionation as a method to improve the nutritional value of rapeseed meal. Feed-a-Gene final meeting, Hotel de Rennes Métropole, Rennes, France. Feed-a-Gene.



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Other partners

25 partners from EU and China, and from public and private sectors: China (1. CHINA AGRICULTURAL UNIVERSITY), Denmark (1. AARHUS UNIVERSITET; 2. HAMLET PROTEIN SA; 3. DUPONT NUTRITION BIOSCIENCES APS), France (1. ACTA ASSOCIATION DE COORDINATION TECHNIQUE AGRICOLE - LES INSTITUTS TECHNIQUES AGRICOLES; 2. IFIP-INSTITUT DU PORC ASSOCIATION; 3. INSTITUT TECHNIQUE DE L'AVICULTURE DE LA CUNICULTURE ET DE LA PISCICULTURE-ITAVI; 4. TERRES INOVIA; 5. CREOL CENTRE DE RECHERCHE ET D EXPERIMENTATION SUR LES OLEAGINEUX ET PROTEAGINEUX SAS; 6. ASSOCIATION FRANCAISE DE ZOOTECHNIE; 7. INRAE TRANSFERT SAS), Hungary (1. KAPOSVARI EGYETEM), Italy (1. GRAN SUINO ITALIANO), Netherlands (1. STICHTING WAGENINGEN RESEARCH; 2. TOPIGS NORSVIN RESEARCH CENTER BV), Spain (1. UNIVERSIDAD DE LLEIDA; 2. INSTITUT DE RECERCA I TECNOLOGIA AGROALIMENTARIES; 3. CENTRE DE RECERCA EN ECONOMIA I DESENVOLUPAMENT AGROALIMENTARI-UPC-IRTA; 4. CENTRE DE RECERCA EN AGRIGENOMICA CSIC-IRTA-UAB-UB; 5. EXAFAN SA; 6. CLAITEC SOLUTIONS SL; 7. INCO (INDUSTRIAL DEL CONEJO), Switzerland (1. BUHLER AG), UK (1. UNIVERSITY OF NEWCASTLE UPON TYNE; 2. COBB EUROPE LIMITED).

9 countries represented by **25 partners** coming from: China, Denmark, France, Hungary, Italy, Netherlands, Spain, Switzerland, United Kingdom



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Relevant links

- <https://www.feed-a-gene.eu/>
- <https://twitter.com/feedagene?lang=gl>
- <https://www.facebook.com/feedagene/>



Relation to the WG meeting

Feed-a-Gene MA focused on the use of **alternative feed resources and new technologies** to improve **monogastric livestock production** while **reducing environmental impact**. It also aims at **improving efficiency by using selective breeding**. These topics are within the scope of the CWG SAP which is looking into the future of sustainable animal production from a holistic perspective, considering the environmental impact, and different ways of increasing animal productivity (efficiency) while keeping sustainability.

Overlaps and gaps in the content compared to the other projects

Feed-a-Gene MA focuses on a relevant theme, **alternative feed resources and new technologies to improve the overall efficiency and reduce the environmental impact in pig, poultry, and rabbit production systems**. Regarding to the SusAn CSRIA, Area 2 is partially covered for those animal species. In the final report, an in-depth analysis and discussion of overlaps and gaps is provided.

2) A Europe-wide thematic network supporting a sustainable future for EU dairy farmers – EuroDairy

3)



Source(s)

CORDIS (<https://cordis.europa.eu/project/id/696364>)
Project website: <https://eurodairy.co.uk/>



Funding details

Source of funding: H2020-EU.3.2. - SOCIETAL CHALLENGES - Food security, sustainable agriculture and forestry, marine, maritime and inland water research, and the bioeconomy
Type of project (+ cluster if relevant): CSA - Coordination and support action
Contract number : 696364
Project total budget: 1 997 237,75



Start and end date of the project

01/02/2016 – 31/01/2019



Project summary

EuroDairy was a network which aimed at increasing the economic, social, and environmental sustainability of dairy farming in Europe. The main purpose of EuroDairy network was to improve the viability and sustainability of milk production in Europe.

The project was divided in 8 Working packages (WP): (i) WP1. Project co-ordination: thematic network, looking for innovation and best practice, including recommendations for further innovation-driven research; (ii) WP 2. Network of innovating pilot farmers and Knowledge Transfer Centres, established a community of innovating dairy farmers which through experience and practice on their own farms, bring good ideas and implementable solutions to EuroDairy. (iii-vi) WPs 3-6 focused on four key topics - Resource efficiency, Biodiversity, Animal care, and Socio-economic resilience. These WPs provided leadership, direction, and technical expertise. (vii) WP 7. Synergies in scientific and practice-based knowledge, draws from WPs 3-6 to capture new insights from combining science with practice-based knowledge, including benefits and trade-offs in solutions identified. (viii) WP 8. Production and communication of end-user materials, to increase productivity, improve competitiveness and impact less on the environment.

This project focused on four key issues: socio economic resilience, resource efficiency, animal care, and the integration of milk production with biodiversity objectives. The project adopted the interactive approach of the European Innovation Partnership, putting farmers at the centre of practice-based innovation, adapting, and developing new and existing scientific knowledge to produce implementable solutions, which can then be shared across the network. Twenty partners span 14 countries, from Ireland to Poland and from Sweden to Italy, bringing EuroDairy to life via **a total of 120 innovating Pilot Farmers participating in the network.**

The project demonstrated the potential for the multi-actor approach to engage farmers, and to help them explore solutions which could be implemented on their own farms. The main constraint is frequently not the availability of technical information, but its customisation and translation into practice. Involving end-users and other actors along the innovation chain, is a more effective method of developing implementable, locally or system-adapted solutions. Through its participating Pilot Farmers, the project has shown that a combination of business acumen, focus on Key Performance Indicators, understanding the cost base in relation to the market available, and planning for volatility it is possible to have a more optimistic outlook on the future. Societal benefits accrue from greater resource efficiency, less environmental impact, maintenance of rural economies, confidence in better standards of animal welfare and the contribution dairy farming makes to biodiversity.



Project results

One hundred and twenty **Pilot Farms** were recruited, based on their innovative thinking and farming activity, and their willingness to share their experiences. Over two financial years, financial and resource efficiency data were collected. Overall, EuroDairy farmers were significantly more profitable than the average EU dairy farms. Following the European Dairy Farmers (EDF) cost of production model, entrepreneur's profit was determined. In 2016, only 26/120 pilot farms showed positive results, rising to 46 in 2017. Regarding Family Farm Income (FFI), 92 (77 %) of farms had a positive value in 2016 (4.8 €/100 kg milk), being 108 (90 %) in 2017 (8.6 €/100 kg milk).

For comparative purposes, Gross Margin was calculated for EuroDairy Pilot farms and compared to farm accountancy data network (FADN) data for 2016. The FADN group had a Gross Margin of 88 €/ton of milk, while EuroDairy Pilot farms averaged 182 €/ton of milk. Concerning the net economic income, only 9 % of EU farms had a positive value compared with 22 % of EuroDairy pilot farms. Variation in N and P surplus and efficiencies were calculated for each of 10 farm systems. For 9/10 systems, use efficiency varied within the range 0.2 – 0.4 and 0.4 – 0.9 for N and P, respectively. The system with the highest efficiencies (0.55 and 1.25 for N and P respectively) was characterized by significant export of nutrients as organic manures. The best performing farms were calculated to be 18% lower in N surplus relative to the system average (range -3 % to -56 % across the 10 farm systems).

Additionally, the project set out to conduct biodiversity audits on a third of the participating farms. The biodiversity audits were conducted using the BIOTEX tool on 52 pilot farms in 10 countries. It was shown that most farms had a positive impact on biodiversity.

Moreover, it aimed to combine the supporting measures of the Thematic networks by connecting with 42 regional Operational Groups. Knowledge was exchanged across the network by means of farmer exchange visits, technical workshops, and interactive webinars. A total of 14 cross border farmer visits (involving 10 countries, over 350 participants, 56 farms and 16 separate organisations) were carried out. These visits provided the opportunity to share knowledge, assess the strengths and weaknesses of dairy production in the countries visited, and provide feedback of research and policy needs. Furthermore, 28/43 Operational Groups were funded through regional Rural Development Programmes, and 15 were supported by other funding sources. The coordinators were gathered in a workshop to explore synergies between Operational Groups and Thematic Networks. Experts, advisors and farmers were brought together in technical workshops to share scientific and practice – based knowledge, and identify gaps to be addressed by future R&D. A total of 4 international workshops were organised on resource efficiency, water use, opportunities and challenges for grazing dairy cows and strategies to improve feed efficiency. Two more workshops were carried out to capture current knowledge, emerging thinking and relevant initiatives on biodiversity. Under the theme of Animal Care, four cross border workshops were additionally run: reducing antimicrobial use, practical welfare assessment, "Welfare plus" probing new boundaries in animal welfare, and alternative housing systems for dairy cattle. On socio – economic resilience, seven workshops were organised: x2 "lean management", "optimizing the future value of milk", and cost of production and future farming strategy.

Finally, an important focus for the project was the development of resilient farming systems which sustain a smaller

reduction in productivity resulting from a shock or disturbance, recover more quickly and more completely than a less resilient system. Resilience management was discussed in workshops in Flanders, Normandy and during the final pan – European workshop, “Dairy Farming in a Changing world”, which took place in Brussels.

As [output](#), EuroDairy produced 20 press releases and articles, 42 webinars, 22 technical leaflets, 41 practice-based abstracts, 9 video case studies /video magazines, one ‘legacy’ movie and over 30 further digital pieces. In addition, 16 individual reports covering technical subjects, research and development requirements and recommendations for policy makers can be found on the EuroDairy website.



Lead partner

THE AGRICULTURE AND HORTICULTURE DEVELOPMENT BOARD (AHDB), UK, Research Organisation



Other partners

Belgium (1. INNOVATIESTEUNPUNT VOOR LANDBOUW EN PLATTELAND; 2. EIGEN VERMOGEN VAN HET INSTITUUT VOOR LANDBOUW- EN VISSERIJONDERZOEK), Denmark (1. SEGES PS; 2. LANDBRUG & FODEVARER F.M.B.A.), Finland (1. LUONNONVARAKESKUS), France (1. INSTITUT DE L'ELEVAGE; 2. CENTRE NATIONAL INTERPROFESSIONNEL DE L'ECONOMIE LAITIERE), Germany (1. CHRISTIAN-ALBRECHTS-UNIVERSITAET ZU KIEL), Ireland (1. TEAGASC - AGRICULTURE AND FOOD DEVELOPMENT AUTHORITY), Italy (1. CENTRO RICERCA PRODUZIONI ANIMALI- SOC. CONS. P. A.), Netherlands (1. STICHTING WAGENINGEN RESEARCH; 2. ZUIVELNL; 3. ZUIDELIJKE LAND- EN TUINBOUWORGANISATIE VERENIGING), Poland (1. SZKOLA GLOWNA GOSPODARSTWA WIEJSKIEGO), Portugal (1. UNIVERSIDADE DE TRAS-OS-MONTES E ALTO DOURO), Slovenia (1. UNIVERZA V LJUBLJANI), Spain (1. UNION DE COOPERATIVAS ASOCIACION GALEGA DE COOPERATIVAS AGRARIAS; 2. NEIKER-INSTITUTO VASCO DE INVESTIGACION Y DESARROLLO AGRARIO SA), Sweden (1. LANTBRUKARNAS EKONOMI-AB; 2. LRF KONSULT AKTIEBOLAG), UK (1. THE NORTHERN IRELAND AGRICULTURAL RESEARCH AND DEVELOPMENT COUNCIL).

Countries represented by 21 partners coming from: Belgium, Denmark, Finland, France, Germany, Ireland, Italy, Netherlands, Poland, Portugal, Slovenia, Spain, Sweden.



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Relevant links

- <https://twitter.com/eurodairy>
- <https://www.facebook.com/EuroDairyProject/>



Relation to the WG meeting

In relation to the CWG SAP scope, which covers on-farm management and husbandry interventions that have impacts either up-or down-stream of the entire supply chain (e.g. land use change, product quality, processing costs, waste, and consumer behaviour), and sees collaboration at European level as an efficient and necessary way to contribute to shape the future research and innovation in livestock production, the main purpose of EuroDairy network (14 countries and 120 pilot farmers) was to **improve the viability and sustainability of milk production in Europe**. Based on 8 WP, looking for innovation, networking and **focusing on four key topics: socio economic resilience, resource efficiency, animal care, and the integration of milk production with biodiversity objectives**.

Overlaps and gaps in the content compared to the other projects

EuroDairy focuses on networking with the goal of **increasing the economic, social, and environmental sustainability of dairy farming in Europe**. Regarding to the SusAn CSRIA, Area 3 is covered by the overall sustainable approach, and Areas 1 and 5 by the broad networking established across Europe. In the final report, an in-depth analysis and discussion of overlaps and gaps is provided.

3) Innovation for sustainable sheep and goat production in Europe – iSAGE MA



Source(s)

CORDIS (<https://cordis.europa.eu/project/id/679302>)
<https://www.isage.eu/>



Funding details

Source of funding: H2020-EU.3.2. - SOCIETAL CHALLENGES - Food security, sustainable agriculture and forestry, marine, maritime and inland water research, and the bioeconomy
Type of project (+ cluster if relevant): RIA - Research and Innovation action
Contract number: 679302
Project total budget: € 6 996 922



Start and end date of the project

01/03/2016- 29/02/2020



Project summary

The purpose of iSAGE is to find ways to make the **sheep and goat sectors sustainable in Europe, considering the special characteristics that each country offers**. Therefore, iSAGE aims at improving the **innovative capacity** of these two sectors by **making farms more efficient and profitable**. Additionally, this project intends to **raise awareness** about **how much sheep and goats contribute to the environment**, as well as to **assess the attitudes** of the **consumer and society** to the **EU sheep and goat sector**, in order to increase society **acceptance and the role of sheep and goat products** (meat and milk) in **future diets**.

iSAGE produced strategic information for a more **sustainable and competitive future of the small ruminant industry**. They determined that one of the main problems is the **poor uptake of innovations** mainly as result of the structure of the industry, lack of new entrants and low income despite heavy reliance on subsidies from the Common Agricultural Policy (CAP). It was revealed that sheep and goat farming systems are **little innovative** specially compared to other livestock sectors. The main **challenge is the socioeconomic and structural constraints** that prevent farmer's acceptance and uptake of innovations at farm level. Other challenges included **farmer's reluctance to modify farming practices, lack of innovation culture** across farmer communities, **limited farmer skills and knowledge** in some areas, **low farmer investment capacity, ageing of farmers and rural areas depopulation** trends and **lack of strong and well-organised, long-term, farmer collaborations**. At sector level, **internal competence between value chain stakeholder** (e.g. farmers, processors, distributors, retailers) within the sector **reduces its competitiveness in international markets** but also in relation to other livestock species and to non-livestock food products. iSAGE contributed towards: (i) **supporting supply chains and increasing consumption of sheep and goat products** through **novel labelling, packaging and cuts**, (ii) **climate change and greenhouse gas emissions (GHG)** using **novel methodologies and technologies**, and **informing relevant policies**, (iii) **breeding strategies** based on optimal combination of conventional and novel traits for enhanced animal resilience, efficiency and adaptability, and promoting region-specific use of **local breeds**, and (iv) increasing the **efficient adoption of innovations** to increase the sector's overall **resilience and sustainability** and decrease reliance on public support. Overall, a new holistic farm

level model has been developed. iSAGE provided a **comprehensive understanding** of the **strengths and weaknesses of the sheep and goat industry** as the basis to further develop and meet both farmer and public expectations. A significant part of results has been already disseminated through scientific publications, conference papers and technical reports.



Project results

The results obtained from this project have been disseminated through technical reports (25), scientific articles (16), and conference proceedings (5). Additionally, an Open Research Data Pilot and 10 datasets via OpenAIRE were also generated.

In this project, the **status of sheep and goat farms across Europe** was assessed with an adapted version of the Public Goods Tool (PG Tool), with special focus on **environmental, economic, social and governance themes**. For the study, a total of 236 farms across Europe were included – farms were selected followings specific iSAGE criteria. Results revealed that **sheep and goat farming systems are little innovative** specially compared to other livestock sectors. The main challenge is the **socioeconomic and structural constrains** that prevent farmer's acceptance and uptake of innovations at farm level. Most problems arise directly from farms/farmers -limited farmer skills and knowledge, ageing of farmers and rural areas depopulation trends, farmer's reluctance to modify farming practices, lack of innovation culture across farmer communities-. Furthermore, other challenges are lack of strong and well-organised, long-term, farmer collaborations and low farmer investment capacity. Finally, at sector level, **internal competence** between value chain stakeholder (e.g. farmers, processors, distributors, retailers) within the sector **reduces its competitiveness in international markets** but also in relation to other livestock species and to non-livestock food products.

New **genomic tools** for breeding programs were developed by iSAGE, with special attention to genetic analysis for farm resilience to weather variability (resilience to environment change) (Sánchez-Molano et al., 2019). iSAGE contributed also to **greenhouse gas emissions** (GHG) debate, with suggestions for new calculations for the global warming effect of CH₄, policy implications from the isage case studies* and potential of breeding for resilience to climate change. Research on genetic traits regarding efficiency and resilience was a key issue in iSAGE; relevant genetic parameters have been estimated along with novel animal resilience and adaptability phenotypes based on joint analyses of milk records and weather variables. As a result, a **new holistic farm level model has been developed**.

iSAGE **case studies*** showed that extension programs **emphasizing farm innovation that increase farm efficiency and profitability** are the most effective approach to reduce at the same time the farm environmental impact. Results demonstrated that implementing new practices for product and process innovation in meat sheep production can help improve the sector. Thus, different key strategies can be used such as new packaging and cuts, development of quality labels or other certification and traceability systems and new marketing campaigns to make society aware of the environmental and social services of sheep and goat farming systems. Additionally, competent farming workforce can be achieved by participatory farmer-group training programmes. Finally, iSAGE identified potential partners where all these practices can be implemented such as National organisations with regional branches, strong national network of farms, businesses, organisations and reliable funding sources.

Overall, iSAGE provided a detailed study of **the strengths and weaknesses of the sheep and goat industry** as the basis to further develop and meet both farmer and public expectations.

References:

Sánchez-Molano E, Kapsona VV, Ilska JJ et al. (2019) Genetic analysis of novel phenotypes for farm animal resilience to weather variability. BMC Genet 20: 84. DOI: <https://doi.org/10.1186/s12863-019-0787-z>



Lead partner

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iSAGE has a strong and multi-lateral consortium consisting of **34 partners** from 6 EU countries and Türkiye. Five EU countries involved in the project – France, Greece, Italy, Spain and the UK



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Relevant links

- <https://www.isage.eu/>
- <https://www.facebook.com/isage.eu/>
- https://twitter.com/iSAGE_H2020



Relation to the WG meeting

iSAGE is a project focused on making the **small ruminant (sheep and goat) sector sustainable in Europe**. One of the main topics of interest of the CWG SAP is to determine specific characteristics of the main animal types (including small ruminants) that need to be considered in future livestock scenarios. This project revealed that sheep and goat farming systems are little innovative specially compared to other livestock sectors, and proposed solutions towards improving the innovative capacity of these two sectors by making farms more efficient and profitable.

Overlaps and gaps in the content compared to the other projects

The iSAGE project is specifically focused on **small ruminant sustainability**. Different projects of this portfolio analysis are focused on different species to be able to cover all the aspects requested by the CWG -overall future of livestock in Europe, considering different species-. Regarding to the SusAn CSRIA, Areas 1 and 5 are less developed in this project. In the final report, an in-depth analysis and discussion of overlaps and gaps is provided.

4) EU pig innovation group – EU PiG MA



Source(s)

CORDIS (<https://cordis.europa.eu/project/id/727933>)

Project Website: (<https://www.eupig.eu/>)



Funding details

Source of funding: H2020-EU.3.2. - SOCIETAL CHALLENGES - Food security, sustainable agriculture and forestry, marine, maritime and inland water research, and the bioeconomy.

H2020-EU.3.2.4. - Sustainable and competitive bio-based industries and supporting the development of a European bioeconomy.

H2020-EU.3.2.1. - Sustainable agriculture and forestry.

H2020-EU.3.2.2. - Sustainable and competitive agri-food sector for a safe and healthy diet.

Type of project: CSA - Coordination and support action

Contract number: 727933

Project total budget: € 1 999 999,99



Start and end date of the project

01.11.2016– 31.10.2020



Project summary

The European Union (EU) is the world's second biggest producer of pig meat and is the market's largest exporter. Increasingly due to both policy and consumer demands the environment has been a key focus of challenges, considering reduction of emissions, improving of the farm atmosphere, or obtaining more sustainable feeds. In order to **maintain an economically viable and sustainable pig industry**, innovation is also a key factor.

The EU PiG consortium represents a wide range of 'actors', including national and regional pig producer groups, researchers, rural development boards, innovation practitioners and SMEs. **EU PiG provides a platform for dialogue for the actors, facilitating the exchange of knowledge and sharing of innovative best practice to increase the health, welfare, meat quality and use of precision farming within the European Union (EU) pig industry.**

The specific areas of focus for EUPiG always use four main themes: Health, Welfare, **Precision and Meat Quality, as their base for seeking innovation.** Solutions to challenges identified and available for producers to implement with methods, cost benefits and contacts include: 1. **Health solutions** such as biosecurity tools, methods for optimize antibiotics to zero level, how slaughter data can improve health and profitability, etc.; 2. **Delivery of clean and**

accessible water, that have proven benefits or return on investment; 3. **Engaging with the consumer** looking at innovations in the supply chain (Meat Quality) e.g. feeding olive oil to pigs, social media to engage the consumer and support for niche breeds.

EU PiG specifically aims to **more effectively connect producers with the latest science**, husbandry techniques and technologies from within their industry via fellow producers, academics and advisors connected through thematic and regional platforms.

Specifically, the objectives of the EU PiG project are:

- a) **To map and consolidate existing knowledge from across the EU.**
- b) **To facilitate knowledge exchange to help producers drive and adopt innovation on farm.**
- c) **To bring science led innovations into practice, closing the gap between research and commercial pig production.**



Project results

EUPiG has produced 32 ambassadors (8 per year) across the 4 themes (Health, Welfare, Precision and Meat Quality), that provide detailed solutions to 32 identified industry challenges. This was supported by multiple resources that were transferred through **more than 40 documents** in the final report of the Project.

In the field of Health: Biosecurity tools, **methods for optimising antibiotics to zero level**, how slaughter data can improve health and profitability, **improving gut health and fermentation as alternatives to zinc**, methods for systematic routine weighing and how to deliver clean and accessible water were assessed.

A key focus of challenges has been engaging with the **consumer looking at innovations in the supply chain** (Meat Quality) e.g. Heart pig branding, feeding olive oil to pigs, social media to engage the consumer and support for niche breeds

Increasingly due to both policy and consumer demands the environment has been a key focus of challenges and ambassadors, with **reduction of emissions, improving of the farm atmosphere, more sustainable feeds and methods of auditing sustainability** have identified solutions with best practice case studies available.

On the other hand, EUPiG website has been transformed from a **website** that discusses how the consortium works into a **dissemination vehicle offering multiple sources of information**. These **include 360 videos, video stories, photos and translated factsheets** in local languages of the consortium partners. Dissemination has progressed beyond the website with RPiGs and consortium members supporting each other at conferences and workshops across the EU targeting EU pork producers and farmers. Finally, social media and communications platforms are used extensively to disseminate the best practices to an audience of EU stakeholders.

THE AGRICULTURE AND HORTICULTURE DEVELOPMENT BOARD (AHDB). United Kingdom.



Other partners

Austria (1. VETERINAERMEDIZINISCHE UNIVERSITAET WIEN), Belgium (1. INNOVATIESTEUNPUNT VOOR LANDBOUW EN PLATTELAND), Denmark (1. SEGES PS; 2. LANDBRUG & FODEVARER F.M.B.A.), Finland (1. ELAINTEN TERVEYS ETT RY), France (1. INTERPROFESSION NATIONALE PORCINE; 2. IFIP-INSTITUT DU PORC ASSOCIATION), Germany (1. DEUTSCHER RAIFEISENVERBAND EV), Hungary (1. VAGOALLAT- ES HUS SZAKMAKOZI SZERVEZET ES TERMEKTANACS), Ireland (1. TEAGASC - AGRICULTURE AND FOOD DEVELOPMENT AUTHORITY), Italy (1. CENTRO RICERCA PRODUZIONI ANIMALI- SOC. CONS. P. A., 2. GRAN SUINO ITALIANO), Netherlands (1. ZUIDELIJKE LAND- EN TUINBOUWORGANISATIE VERENIGING; 2. STICHTING WAGENINGEN RESEARCH), Poland (1. SZKOLA GLOWNA GOSPODARSTWA WIEJSKIEGO; 2. POLSKI ZWIAZEK HODOWCOW I PRODUCENTOW TRZODY CHLEWNEJ POLSUS), Spain (1. INSTITUT DE RECERCA I TECNOLOGIA AGROALIMENTARIES), UK (1. BETA TECHNOLOGY LIMITED; 2. AGRIFOOD AND BIOSCIENCES INSTITUTE).

11 countries represented by **19 partners** coming from: Austria, Belgium, Denmark, Finland, France, Hungary, Ireland, Italy, Netherlands, Poland, Spain.



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Relevant links

- <https://www.eupig.eu/>
- https://twitter.com/EU_PiG



Relation to the WG meeting

In relation to the CWG SAP scope, which covers on-farm management and husbandry interventions that have impacts either up-or down-stream of the entire supply chain (e.g. land use change, product quality, processing costs,

waste, and consumer behaviour), and sees collaboration at European level as an efficient and necessary way to contribute to shape the future research and innovation in livestock production, **EU PiG MA built the EU PiG consortium**. This consortium represented a wide range of 'actors', with a network of 19 partner organisations from 13 member states, **facilitating the exchange of knowledge and sharing of innovative best practice to increase the health, welfare, meat quality and use of precision farming within the European Union (EU) pig industry**.

Overlaps and gaps in the content compared to the other projects

The EU PiG MA project focused on EU **pig industry** with the objective of improving management procedures by applying innovative practices and new production systems. Regarding to the SusAn CSRIA, Areas 2 and 4 are partially covered in this project. Additionally, Areas 1 and 5, related to networking and common vision, are also considered. In the final report, an in-depth analysis and discussion of overlaps and gaps is provided.

5) Organic knowledge network on monogastric animal feed – OK-Net, EcoFeed MA



Source(s)

CORDIS (<https://cordis.europa.eu/project/id/773911>)
Project website: <https://ok-net-ecofeed.eu/>



Funding details

Source of funding: H2020-EU.3.2. - SOCIETAL CHALLENGES - Food security, sustainable agriculture and forestry, marine, maritime and inland water research, and the bioeconomy (main programme); H2020-EU.3.2.4. - Sustainable and competitive bio-based industries and supporting the development of a European bioeconomy; H2020-EU.3.2.1. - Sustainable agriculture and forestry; H2020-EU.3.2.2. - Sustainable and competitive agri-food sector for a safe and healthy diet.

Type of project (+ cluster if relevant): CSA - Coordination and support action

Contract number: 773911

Project total budget: € 1 990 368,75



Start and end date of the project

01/01/2018 - 31/03/2021



Project summary

The OK-Net EcoFeed project aims to **help farmers, breeders and the organic feed processing industry** in achieving the **goal of 100% use of organic and regional feed for monogastrics**, in particular pigs, broilers, laying hens and parents of broilers and laying hens. This project has 4 specific objectives: 1. To obtain scientific and practical knowledge available about organic and regional feed production for monogastrics; 2. To create a European network of innovation groups to facilitate exchange and co-creation of knowledge among farmers, business actors, researchers and advisors; 3. To collect end-user material and develop new tools adapted to the needs of farmers and business actors; and 4. To extend the OK-Net knowledge platform (farmknowledge.org) to include the topic of **monogastric animal feed**.

Among the work carried out, OK-Net EcoFeed promoted **reducing the cost of feed production, improving sustainability and animal welfare, and satisfying consumer expectation for traceability of production**. In this project, research needs and barriers to innovation were identified and recommendations for a better targeted and shared research and innovation agenda were proposed. There was an increased farmer knowledge and scientific research results interaction, and exchanges of farmer experience allowing the information to be shared between groups from different countries. Several **solutions** either from existing knowledge or developed during the project were **collected and adapted to the needs of farmers, feed processors and breeders**. These solutions are available as easy-to-read end-user materials and translated into all relevant languages identified.



Project results

This project included participation of different groups, including farmers and other industry partners -12 Innovation Groups (IG) in 8 countries-. A total of 5 official meetings with invited researchers were carried out. In these meetings, relevant potential solutions and results from the testing activities have been discussed. Research data were collected in the field of **'100% organic feed for monogastrics'**, and specifically how to **produce regional feed**. Special attention was paid to **gaps** found in the literature - this exercise led to the knowledge synthesis on feeding organic monogastrics.

A total of 18 innovative groups (IG) **trials** were developed in eight of the participating countries. 50% of them have been taken up by participating practitioners including changes in practice on-farm and the adoption of new technology. Each of the testing activities were translated into easy-to-use dissemination materials such as practice abstracts (PAs) and short videos. Additionally, 31 factsheets and 5 videos were created by the OK-Net EcoFeed partners based on existing knowledge and different tools and videos were translated/subtitled to one or more languages (usually from local language to English). This project also generated one peer-reviewed paper and one report on **research needs and barriers to innovation and recommendations for a better-targeted research and innovation agenda**. This information can be used as a basis for further research towards more sustainable feeding.

This project generated **two ration planning tools**, one for pigs and one for poultry, to help farmers to calculate their own feed on farm and improve local feedstuffs in organic feeds for monogastric. The **OFK**, online since 2018, is a new version of the OK-Net platform built by OK-Net Arable (project ID: 773911; CORDIS: <https://cordis.europa.eu/project/id/773911>). The platform now allows to **upload end-user material** from other thematic networks and multi-actor projects and to cover all practical information relevant to organic farming. The toolbox of the OFK was further extended with 139 OK-Net EcoFeed tools and descriptions. These includes 117 PA and 22 videos covering pigs, broilers, layers, feeding and ration planning used for online dissemination knowledge exchange. Practice abstracts were provided to the EIP-AGRI website using the EIP Common Format for Practice Abstracts.



Lead partner

INTERNATIONAL FEDERATION OF ORGANIC AGRICULTURE MOVEMENTS EUROPEAN UNION REGIONAL GROUP
Sunnarsberg Hog 1, 531 98 Lidköping, Sweden



Other partners

Austria (1. DONAU SOJA GEMEINNUTZIGE GESELLSCHAFT MIT BESCHRANKTER HAFTUNG), Denmark (1. AARHUS UNIVERSITET), France (1. INSTITUT TECHNIQUE DE L AGRICULTURE BIOLOGIQUE; 2. FEDERATION NATIONALE D AGRICULTURE BIOLOGIQUE DES REGIONS DE FRANCE ASSOCIATION (third party); 3. INSTITUT TECHNIQUE DE L'AVICULTURE, DE LA CUNICULTURE ET DE LA PISCICULTURE-ITAVI (third party); 4. CHAMBRE REGIONALE D'AGRICULTURE DES PAYS DE LA LOIRE (third party); 5. IFIP-INSTITUT DU PORC ASSOCIATION (third party)), Germany (1. BIOLAND BERATUNG GMBH; 2. BIOLAND E.V. (third party)), Italy (1. CENTRO INTERNAZIONALE DI ALTISTUDI AGRONOMICI MEDITERRANEI (third party); 2. ASSOCIAZIONE ITALIANA PER L'AGRICOLTURA BIOLOGICA), Serbia (1. DONAU SOJA DRUSTVO SA

OGRANICENOM ODGOVORNOSCU NOVI SAD (third party), Spain (1. ASOCIACION ECOVALIA; 2. UNIVERSIDAD DE CORDOBA (third party)). Sweden (1. SVERIGES LANTBRUKSUNIVERSITET), Switzerland (1. FORSCHUNGSINSTITUT FUR BIOLOGISCHEN LANDBAU STIFTUNG), UK (1. PROGRESSIVE FARMING TRUST LTD LBG; 2. THE SOIL ASSOCIATION LIMITED).
10 countries represented by **18 partners** coming from: Austria, Denmark, France, Germany, Italy, Serbia, Spain, Sweden, Switzerland, United Kingdom.



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Relevant links

- <https://ok-net-ecofeed.eu/>
- <https://twitter.com/ecofeed>
- <https://www.facebook.com/oknetecofeed/>
- <https://organic-farmknowledge.org/>
- https://twitter.com/farm_knowledge
- <https://www.organicseurope.bio/?redirect=1>



Relation to the WG meeting

OK-Ne EcoFeed is focused on the use of **organic and regional feed for monogastrics**. These topics are within the scope of the CWG which is looking into the future of sustainable animal production from a holistic perspective but also considering the special characteristics/needs of each region within Europe. All in all, this project aims at getting a better perspective and knowledge of organic farming as a transitional way towards increasing animal productivity (efficiency) while keeping sustainability.

Overlaps and gaps in the content compared to the other projects

OK-Net EcoFeed focuses on a relevant theme, **organic feeding, in particular for monogastrics, with special attention to regional feed**. Regarding to the SusAn CSRIA, Area 1 is less developed in this project. In the final report, an in-depth analysis and discussion of overlaps and gaps is provided.

6) Innovative nutrient recovery from secondary sources – Production of high – added value FERTIlisers from animal MANURE– FERTIMANURE



Source(s)

CORDIS (<https://cordis.europa.eu/project/id/862849>)
Project website: <https://www.fertimanure.eu/>



Funding details

Source of funding: «H2020-EU.3.2. - SOCIETAL CHALLENGES - Food security, sustainable agriculture and forestry, marine, maritime and inland water research, and the bioeconomy (MAIN PROGRAMME)
H2020-EU.3.2.1.1. - Increasing production efficiency and coping with climate change, while ensuring sustainability and resilience
H2020-EU.3.2.4.1. - Fostering the bio-economy for bio-based industries
Type of project (+ cluster if relevant): IA – innovation action
Contract number : 862849

Project total budget: €8,380,523.72



Start and end date of the project

01/01/2020 – 31/12/2023



Project summary

FERTIMANURE will develop, integrate, test, and validate innovative **Nutrient Management Strategies** to efficiently recover mineral nutrients and other products with agronomic value from manure, to finally obtain reliable and safe **fertilisers** that can compete in the EU fertilizers market. **It will implement 5 innovative & integrated nutrient recovery on-farm experimental pilots in the most relevant European countries in terms of livestock production** (Spain, France, Germany, Belgium, The Netherlands), whereas the nutrient management will be addressed through 3 different strategies adapted to mixed and specialised farming systems: (Strategy #1) On-farm production and use of Bio-Based Fertilisers (BBF), (Strategy #2) On-farm BBF production and Centralised Tailor-Made Fertilisers (TMF) production and (Strategy #3) On-farm TMF production and use.

Ultimately, FERTIMANURE seeks to provide an innovative **circular economy model** to favour rural development in agricultural sector by creating real synergies and links within farmers and other industrial activities.

More than 90 % of the manure produced by livestock farms in the EU is used for land fertilisation. However, this process is inefficient. The EU-funded FERTIMANURE project intends to develop, test, and estimate advanced nutrient management strategies to produce competitive fertilisers that contribute to good yield. Their goal is to **recycle valuable nutrients from livestock manure and produce bio-based fertilisers**. FERTIMANURE will be deployed in five of the EU's biggest livestock production countries, namely Belgium, France, Germany, the Netherlands, and Spain.

Outcomes should help promote this circular economy model for the EU agriculture sector.

This project deals with the current topic of **sustainable innovative manure management**. It is divided in: **agronomic objectives** (achieve high NUE and an effective use of organic matter); **environmental objectives** (low emissions); **social/societal objectives** (safety, human health and no odour generation).



Project results

From months 1 – 18, the baseline information and working framework for the societal challenge which FERTIMANURE addresses was established. WP1 obtained **key baseline data** about animal densities and nutrient generation in the different participating countries and regions. Additionally, it has characterized the current **nutrient imbalances across Europe** stemming from livestock manure and it has executed an **analysis of the policy and legislation framework** surrounding organic fertilizers. The broadness of this analysis has been important for establishing the abundance, volume, and potential value of bio-based fertilizers and tailor – made fertilizers (TMFs), which are produced by WP3. Moreover, a **market landscape analysis** has provided necessary information for WP6 to elaborate the new business models and plans proposed by FERTIMANURE to promote competitive new fertilizing products produced in the EU market.

Furthermore, other key work within this period is the design and construction of the **5 FERTIMANURE on – farm pilots** (WP2), as well as the **pilot on– farm TMFs production** (WP3). Currently, all these pilots are installed and operating. They comprise a key element in the project work plan, as they will recover the nutrients to produce the foreseen bio – based fertilizers that will be later used to produced TMFs (WP3), which are tested to demonstrate their competitiveness in the market (WP4, WP6). Until now, up to **19 bio – based fertilizers have been produced** and characterized, 8 more than the number initially foreseen in the DoA. Therefore, the first reporting period ended with all the pilots ready and 19 bio – based fertilizers produced. Additionally, an Excel tool has been developed to calculate the optimal combination of fertilizers to be used to meet the legal restrictions and/or crop recommendations. This tool is aiming to be used by farmers to efficiently calculate the optimal amount of bio – based fertilizers and mineral fertilizers to properly formulate a specific TMF depending on the soil type and the targeted crop.

Concerning communication and dissemination, WP7 created the basis for project branding, the project website, a promotional video which has been translated to all the languages of the consortium, and also the project Newsletter, emitted every 6 months. Most partners have participated in online conferences and have published in different media. In addition, Biorefine Cluster Europe and FERTIMANURE have strengthened ties to create a new community group, Closing Nutrient Cycles, and is expecting to start its activity by the end of 2021.

Finally, the project has **published** several deliverables, including practice abstracts, data management plans and dissemination material.



Lead partner

FUNDACIO UNIVERSITARIA BALMES, Spain, Higher or Secondary Education Establishments



Other partners

24 partners: Argentina (1. INSTITUTO NACIONAL DE TECNOLOGIA AGROPECUARIA), Belgium (1. UNIVERSITEIT GENT; 2. POLE GREENWIN; 3. EUROPEAN LANDOWNERS ORGANISATION; 4. FERTILIZERS EUROPE), Chile (1. FUNDACION LEITAT CHILE), Croatia (1. IPS KONZALTING DOO ZA POSLOVNE USLUGE), France (1. CHAMBRES D'AGRICULTURE FRANCE; 2. CHAMBRE REGIONALE D'AGRICULTURE DE BRETAGNE; 3. CHAMBRE DEPARTEMENTAL D'AGRICULTURE DE LA SOMME; 4. CRA GRAND EST; 5.

RECH INNOV TRANSFERT TECHN MAT FERT ORG), Germany (1. FRAUNHOFER GESELLSCHAFT ZUR FORDERUNG DER ANGEWANDTEN FORSCHUNG EV), Italy (1. UNIVERSITA DEGLI STUDI DI MILANO; 2. AGRIFUTUR SRL), Netherlands (1. STICHTING WAGENINGEN RESEARCH; 2. DORSET GREEN MACHINES BV; 3. MAATSCHAP J.G EN J.A. PRINSEN), Poland (1. POLSKI ZWIAZEK HODOWCOW I PRODUCENTOW BYDLAY MIESNEGO), Spain (1. ACONDICIONAMIENTO TARRASENSE ASSOCIACION; 2. AGRARIA PLANA DE VIC I SECCIO DE CREDIT SCCL; 3. ALGAENERGY SA; 4. FERTINAGRO BIOTECH SL; 5. Departament d'Acció Climàtica, Alimentació i Agenda Rural)

Countries represented by **24 partners** coming from: Argentina, Belgium, Chile, France, Germany, Italy, Netherlands, Poland, Spain



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- <https://www.fertimanure.eu/en/contact>



Relevant links

- <https://twitter.com/fertimanure>
- <https://www.facebook.com/fertimanure/>
- <https://www.linkedin.com/company/fertimanure/>



Relation to the WG meeting

The CWG SAP acknowledges the three development paths described in the 5th SCAR Foresight Report from 2020: diversity, circularity, nutrition. The CWG SAP also assumes that livestock will be a part of the solution to challenges that the European agri-food system is facing today. Thus, FERTIMANURE aims **to develop a circular economy strategy based on the optimization of the manure produced by livestock farms**. The expected Impacts: 1) Development of new technological approaches for **a new generation of commercial, sustainable and safe**

fertilisers from livestock waste. 2) **Replacement of conventional, non-renewable mineral fertilisers**, reducing the high dependence that the EU currently has on external sources for the supply of key fertilisers used in agriculture, including natural gas and rock phosphate. 3) **Reduction in the environmental impacts linked to the emissions and dispersion of nutrients** present in waste flows, and/or to the production of fossil-based fertilisers. 4) **Replication of the 5 experimental pilots in different contexts** at the EU level, but also internationally, with the consequent expectation of encouraging new policies and initiatives in nutrient recycling and manure management. In the long-term, FERTIMANURE will contribute to the development of new business models that are synergetic with other economic sectors and will, therefore, **create wealth and high-quality jobs in rural areas**.

Overlaps and gaps in the content compared to the other projects

FERTIMANURE project involves **circular economy, and aims at optimizing the manure produced in livestock farms**. Regarding to the SusAn CSRIA, Areas 2 and 3 are more developed in this project. In the final report, an in-depth analysis and discussion of overlaps and gaps is provided.

7) Co-designed Welfare Monitoring Platform for Pig and Dairy Cattle – ClearFarm



Source(s)

CORDIS (<https://cordis.europa.eu/project/id/862919>)
Project Website: (<https://www.clearfarm.eu/clearfarm-platform/>)



Funding details

Source of funding: H2020-EU.3.2. - SOCIETAL CHALLENGES - Food security, sustainable agriculture and forestry, marine, maritime and inland water research, and the bioeconomy (MAIN PROGRAMME)
H2020-EU.3.2.1.1. - Increasing production efficiency and coping with climate change, while ensuring sustainability and resilience.
Type of project (+ cluster if relevant): IA - Innovation action
Contract number: 862919

Project total budget: € 6684368,69



Start and end date of the project

01.10.2019– 31.03.2024



Project summary

Dairy cows and pigs represent the two livestock production systems with the highest share in Europe. Although the need for animal welfare is widely accepted as indispensable for sustainable farming, existing instruments to evaluate animal welfare are too slow and have high costs. Precision livestock farming (PLF) technology offers better control and ameliorates farming processes and allows to monitor and optimize farming processes.

For that purpose, **ClearFarm proposes to use precision livestock farming (PLF) technology and integration of animal-based data, based on a blockchain approach, to enable improved animal welfare across the entire production chain.**

The project aims to co-design, develop and validate a software platform powered by an algorithm integrating PLF data taking into consideration the geographical differences in Europe to provide animal welfare information, as well as other environmental and economic sustainability information that will assist (i) production chain stakeholders and (ii) consumers on decision making **within the pig and dairy cattle value chains.**



Project results

The **project is still in progress**, but at the moment in the website of the EU (<https://cordis.europa.eu/project/id/862919>) and official Project Website (<https://www.clearfarm.eu/clearfarm-platform/>) they exposed: 1 Communication materials, 1 documents and reports, 15 peer reviewed articles and 21 conference proceedings.

So far, they have gathered **detailed information on consumers' and other stakeholder's views on the potential and perceived risks of using automatically recorded information to assess the welfare of farm animals**. Their findings indicate that, although stakeholders have a generally positive view of such an approach, they also perceive some risks, including the fear that the integration of automatically recorded data will introduce more industrialisation into livestock farming production; the concern that such data are vulnerable to misuse and cyber-crime, and that it is not communicated adequately to allow informed purchase decisions. These research findings provide directions for members of the animal-based food value chain to make informed decisions to improve their sustainability, social responsibility, and credibility by endorsing the acceptance automatically recorded data to assess farm animal welfare amongst European consumers.

On the other hand, they have reviewed the existing validated and commercially available technologies that could be used for sensor-based welfare assessment in dairy cattle and pigs. Their findings show that existing technologies are potential tools for on-farm animal welfare assessment in pig and dairy cattle production. However, validation studies are lacking for an important percentage of market available tools. In particular, **research and development need to focus on identifying technologies to assess the animals' affective states or emotions, both positive and negative**.

At this moment, they are waiting for the results of in developing trials on pig and dairy farms to validate several automatic recording systems. The data are going to allow them to design a platform to assess the welfare of pigs and dairy cattle using automatically recorded information. These will hopefully provide valid information on the behavior and affective state of farm animals and will be a valuable tool for European consumers contributing to the sustainability of the European livestock industry considering consumers' expectations.



Lead partner

UNIVERSITAT AUTONOMA DE BARCELONA, Spain, Higher or Secondary Education Establishments.



Other partners

Denmark (1. SKOV AS GLYNGORE; 2. AARHUS UNIVERSITET), Finland (1. LUONNONVARAKESKUS; 2. HAMEENLINNAN OSUUSMEIJERI; 3. TIKAN MAATILA OY), Israel (1. CATTLE WATCH LTD; 2. HERD-ITT LTD), Italy (1. UNIVERSITA DEGLI STUDI DI MILANO), Netherlands (1. CONNECTERRA BV; 2. ESHUIS BV; 3. WAGENINGEN UNIVERSITY) Spain (1. FUNDACIO PRIVADA PARC DE RECERCA UAB; 2. SYNTESA PARTNERS AND ASSOCIATES SL; 3. UNIVERSIDAD DE MURCIA; 4. ELPOZO ALIMENTACION SA; 5. CEFU, SA; 6. SOCIEDAD COOPERATIVA ANDALUZA GANADERA DEL VALLE

DE LOS PEDROCHES)

4 countries represented by 17 partners coming from: Denmark, Finland, Italy and Spain



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Relevant links

- <https://www.clearfarm.eu/>
- <https://twitter.com/ClearFarmEU>
- <https://www.facebook.com/ClearFarmEU/>
- <https://www.linkedin.com/company/clearfarm/>
- https://www.instagram.com/clearfarm_project/



Relation to the WG meeting

In relation to the CWG SAP scope, which covers the entire production chain, including on-farm management and husbandry interventions that have impacts either up-or down-stream of the entire supply chain (i.e.. land use change, product quality, processing costs, waste, and consumer behaviour), ClearFarm focuses on **dairy cows and pigs** which represent the two livestock production systems with the highest share in Europe. ClearFarm proposes to use **precision livestock farming (PLF) technology and integration of animal-based data**, based on a blockchain approach, to enable improved animal welfare across the entire production chain. These will hopefully provide valid information on the behavior and affective state of farm animals and will be a valuable tool for European consumers **contributing to the sustainability of the European livestock industry taking into account consumers' expectations.**

Overlaps and gaps in the content compared to the other projects

ClearFarm proposes to use **precision livestock farming (PLF)** with the final aim of improving sustainability of animal production in Europe. Regarding to the SusAn CSRIA, Areas 2 and 3 are more developed in this project. Also, considering that PLF also contributes towards improving animal welfare, this project inevitably partially overlaps with the scope of the AH&W SCAR group. In the final report, an in-depth analysis and discussion of overlaps and gaps is provided.

8) Poultry and Pig Low-input and Organic production systems' Welfare – PPILOW



Source(s)

CORDIS (<https://cordis.europa.eu/project/id/816172>)
Project website: <http://www.ppilow.eu/>



Funding details

Source of funding: H2020-EU.3.2. - SOCIETAL CHALLENGES - Food security, sustainable agriculture and forestry, marine, maritime and inland water research, and the bioeconomy (MAIN PROGRAMME); H2020-EU.3.2.1.1. - Increasing production efficiency and coping with climate change, while ensuring sustainability and resilience
Type of project (+ cluster if relevant): RIA - Research and Innovation action
Contract number : 816172
Project total budget: €9,999,610.79



Start and end date of the project

01/09/2019 – 31/08/2024



Project summary

The PPILOW project aims to co-construct through a multi-actor approach solutions to improve the welfare of poultry and pigs reared in organic and low-input outdoor farming systems.

Consumers are moving away from industrialised bulk production towards **high quality organic or low-input outdoor farming**, which uses management practices and alternative remedies to manage the health of their animals. Organic pig and poultry production is expanding globally to meet this demand. The EU-funded PPILOW project will co-construct solutions to improve the welfare of poultry and pigs reared in organic and low-input outdoor farming systems. It will involve all actors of the production chain – from farmers to consumers and scientists to policymakers. **The project will design assessment tools, innovative breeding and rearing strategies, and techniques for improving the welfare of animals.** To ensure rapid uptake, the project plans to disseminate activities through trainings, videos and field partners. It will provide practical solutions for welfare improvement applicable on a pan-European basis.



Project results

The PPILOW project has already generated novel information on how to improve animal welfare in organic and low-input pig and poultry farms. The PPILOW partners organised the participatory approach by setting-up nine National Practitioner Groups (NPG) dedicated to pig or poultry in six countries. They contributed to identify barriers to welfare and levers for improvement and co-created with the PPILOW partners shared tools and strategies for improving animal welfare to be tested experimentally and on – farm.

A first **inventory of barriers to welfare and levers for improvement** was built-up, and partners collected the opinions from 26 focus groups of farmers, citizens, processors of livestock products, retailers, and EU policy makers on welfare issues and potential solutions in these systems. Key informant interviews pointed out obvious differences between countries in challenges these farms face but results also indicated shared challenges and solutions such as those relating to feeding, weather, injuries, lack of expression, biosecurity, and range management. Industry members and consumers in all countries indicated a high level of support for animal welfare, but there is often a lack of consensus as to what constitutes best practice regarding the variety of activities in the different production systems.

Additionally, the NPG members contributed to co-build the PIGLOW (for pigs) and EBENE (for poultry) apps, standardized mobile apps for farmers to self – assess and benchmark on – farm the welfare status of the animals. Both apps are now freely available in App stores in English, Dutch and French, and are currently being evaluated in longitudinal on – farm studies in pig farms.

Meanwhile, the creation of a **global framework** based on the One Welfare approach centred on both human and animal welfare is almost complete, which includes a multi – criteria (economic, social and environmental) assessment of welfare improving strategies.

Regarding **innovative breeding and rearing strategies, alternatives to beak trimming using innovative incubation and insect larvae enrichment processes in laying hens, and to piglet castration, are under study**. First results indicate that birds with enrichment showed more foraging behaviour and were less fearful towards humans. Moreover, two trials are prepared in research facilities on – farm, to provide information regarding the role of genotype, age and weight at slaughter and the diet and housing conditions on the occurrence of boar taint in slaughter pigs. In addition, for finding alternatives to the elimination of day – old layer male chicks, three experimental trials are comparing dual – purpose genotypes. The one completed on both males and females in Denmark showed a high variability of technical performance between genotypes, due to different strategy for crosses, exhibiting less or high layer or meat potentials. Concerning ovo sexing, refinements on methodologies for electrophysical sensing have been assessed. Finally, innovations for favouring positive behaviours, health and robustness by increasing adaptation to organic and outdoor systems for laying hens, slow-growing broilers and pigs are explored. Studies with different broiler genotypes have allowed a better understanding of the determinants of exploratory behaviour. Furthermore, partners working with layers and pigs are developing strategies to limit intestinal parasitic and bacterial infections through different feed supplements. In infected layers, the effect of a feed based on fermented products has been tested. Microbiological, immunological and parasitic profiles were obtained in pigs, and in vitro methods for the screening of plant extracts have been established. Joint protocols are developed and implemented in France and Denmark to improve the sow welfare and piglet survival through selective breeding and innovation within farrowing house design for outdoor rearing of sows and piglets. All these preliminary results have already aroused the interest of NPG members, who are ready to participate to PPILOR on – farm studies, for solving concretely important challenges in poultry and pig low – input and organic systems.

Finally, PPILOW **developed** online tools, released journal articles and interviews for communicating on its activities and results, and co – organised the joint online conference “Improving Sustainability and Welfare in Organic Poultry and Pig production” with 3 other EU projects.



Lead partner

Institut National de Recherche pour l'Agriculture, l'Alimentation et l'Environnement, France, Research

Organisations



Other partners

Belgium (1. EIGEN VERMOGEN VAN HET INSTITUUT VOOR LANDBOUW- EN VISSERIJONDERZOEK; 2. CENTRE WALLON DE RECHERCHES AGRONOMIQUES; 3. BIOFORUM; 4. MILLIBETER), Denmark (1. AARHUS UNIVERSITET; 2. Fermentationexperts AS; 3. VANGGAARD JAN BRO), Finland (1. LUONNONVARAKESKUS), France (1. INSTITUT NATIONAL D'ENSEIGNEMENT SUPERIEUR POUR L'AGRICULTURE, L'ALIMENTATION ET L'ENVIRONNEMENT; 2. ACTA ASSOCIATION DE COORDINATION TECHNIQUE AGRICOLE - LES INSTITUTS TECHNIQUES AGRICOLES; 3. INSTITUT DE L'ELEVAGE; 4. INSTITUT TECHNIQUE DE L'AVICULTURE, DE LA CUNICULTURE ET DE LA PISCICULTURE-ITAVI; 5. INSTITUT TECHNIQUE DE L'AGRICULTURE BIOLOGIQUE; 6. IFIP-INSTITUT DU PORC ASSOCIATION; 7. SYNDICAT DES SELECTIONNEURS AVICOLES ET AQUACOLES FRANCAIS; 8. JUNIA; 9. CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE CNRS; 10. INSTITUT NATIONAL DES SCIENCES APPLIQUEES DE TOULOUSE; 11. UNIVERSITE PAUL SABATIER TOULOUSE III; 12. INRAE TRANSFERT SAS), Germany (1. JOHANN HEINRICH VON THUENEN-INSTITUT, BUNDESFORSCHUNGSINSTITUT FUER LAENDLICHE RAEUME, WALD UND FISCHEREI), Italy (1. ASSOCIAZIONE ITALIANA PER L'AGRICOLTURA BIOLOGICA; 2. FEDERAZIONE EUROPEA DI ZOOTECNICA; 3. UNIVERSITA DEGLI STUDI DI PERUGIA; 4. FONDAZIONE SLOW FOOD PER LA BIODIVERSITA ONLUS), Netherlands (1. UNIVERSITEIT UTRECHT; 2. WAGENINGEN UNIVERSITY), Romania (1. UNIVERSITATEA DE STIINTE AGRICOLE SI MEDICINA VETERINARA CLUJ NAPOCA), United Kingdom (1. HARPER ADAMS UNIVERSITY)

Countries represented by **29 partners** coming from: Belgium, Denmark, Finland, France, Germany, Italy, Netherlands, Romania, United Kingdom



Contacts

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Relevant links

- <https://twitter.com/PPILOWH2020>
- <https://www.facebook.com/PPILOW>
- <https://www.zenodo.org/communities/ppilow/?page=1&size=20>



Relation to the WG meeting

The scope of the CWG SAP includes a perspective that lies outside the on-farm system, i. e. beyond farm gate. This covers areas like the role of livestock in circular agri-food systems or the contribution of livestock to ecosystem services. The main topic of PPILOW is **“Poultry and Pig organic and low – input outdoor farming”**, which is mainly related to achieving **sustainable animal production through outdoor/organic farming**. Additionally, it also focuses on **food security** and **animal health and welfare research**, as it involves research about alternative breeding and rearing strategies for these species and preventive management practices during slaughter.

Overlaps and gaps in the content compared to the other projects

The **PPILOW** project aims at achieving sustainability in two farm species (**poultry and pigs**) by employing outdoor/organic farming. Regarding to the SusAn CSRIA, Areas 2 and 3 are more developed in this project. This project also contributes towards improving animal welfare, and therefore it inevitably partially overlaps with the scope of the AH&W SCAR group. In the final report, an in-depth analysis and discussion of overlaps and gaps is provided.

9) Innovative tools for assessment and authentication of chicken meat, beef and dairy products' qualities – INTAQT MA



Source(s)

CORDIS (<https://cordis.europa.eu/project/id/101000250>)
Project Website: (<https://h2020-intaqt.eu/>)



Funding details

Source of funding: H2020-EU.3.2. - SOCIETAL CHALLENGES - Food security, sustainable agriculture and forestry, marine, maritime and inland water research, and the bioeconomy.
H2020-EU.3.2.1.1. - Increasing production efficiency and coping with climate change, while ensuring sustainability and resilience.

Type of project (+ cluster if relevant): RIA - Research and Innovation action
Contract number: 101000250

Project total budget: € 6 155 318,75



Start and end date of the project

01.06.2021– 31.05.2026



Project summary

Agri-food chain actors have a **lack of reliable** and **robust information** to meet consumer expectations, in relation to the multiple aspects of intrinsic quality of livestock products.

INTAQT will make the proof of concept based on chicken and cattle sectors and show that it is feasible to redesign in a **holistic manner the agri-food chains** in order to reconcile the various demands of all actors from producers to citizens and consumers concerning sustainability and intrinsic quality of products.

The initiative will focus on unprocessed and processed ready-to-eat chicken meat, beef and dairy products stemming from husbandry systems of different European countries from both **extensive and intensive husbandry systems**. Researchers will develop quality assessment and authentication tools that provide science-based decision support for policy makers, industries, farmers and consumers, in addition to improving husbandry practices.

INTAQT will involve a multi-actor participatory approach including **all actors of the agri-food chains, from farmers to**

consumers, scientists, certification bodies, policy makers and citizens. Furthermore, the claim “One quality” will be the culmination of quality tools developed to assess and to **improve husbandry practices complying with the high quality of animal products and their sustainable way of production.**

The specific objectives of this project are:

- a) Develop **comprehensive models** quantifying the **impact of husbandry systems on quality traits** related to product safety, nutritional value and sensory features.
- b) Construct with **agri-food chain actors** rapid and cost-effective innovative and practical analytical tools for the **prediction of the intrinsic quality of livestock products** and authentication of the associated husbandry systems.
- c) Construct with agri-food chain actors, multi-criteria scoring tools of the intrinsic quality of products.
- d) Promote **farming practices** adapted to the **diversity of European livestock systems**, which allow the production of safe, healthy and tasty animal products while ensuring a decent income for farmers and respecting animal welfare and the environment.



Project results

At the moment the project is in progress (01.06.2021-31.05.2026) and the results and deliverables exposed in the official website and in EU database are: two peer reviewed articles and five conference proceedings.

In the peer reviewed article titled: *The evolution of vimentin and desmin in Pectoralis major muscles of broiler chickens supports their essential role in muscle regeneration* (Front. Physiol., 05 September 2022 Sec. Avian Physiology Volume 13 - 2022 | <https://doi.org/10.3389/fphys.2022.970034>), the authors reach the conclusion of the existence of a relationship between the occurrence of muscle regeneration and the growth rate of meat-type in fast-growing (FG) and medium-growing (MG) chicken. They also corroborate the potential use of two muscle-specific proteins (VIM and DES) that are having crucial roles in maintaining the lateral organisation and alignment of the sarcomeric structure during myofibrils' regeneration as a suitable molecular markers of these cellular processes.

Three conference proceedings were presented in the “73rd Annual Meeting of the European Federation of Animal Science” (Porto, Portugal; 5 – 9 September, 2022):

- 1) *The INTAQT project: tools to assess and authenticate poultry, beef and dairy products.*

They have presented a brief description and the main objectives of the project.

- 2) *How to assess beef and dairy products qualities according to farming systems: a review .*

This is a review with specific emphasis on the concurrently study of quality traits related to safety, nutritional value and sensory features of beef and dairy products in view of developing multi-criteria assessment for the characterisation of the global intrinsic quality of products.

3) *Consumer's expectations about quality of livestock products: focus groups in 4 European countries.*

This contribution presents some preliminary results of the project, which aims to perform an in-depth multi-criteria assessment of the relationships between animal husbandry and qualities of livestock products. Specifically, collecting insights on the expectations of consumers about intrinsic and extrinsic quality of chicken meat, beef and dairy products in Italy, France, Germany and the UK. Results evidenced that **consumers are very interested in both origin and production systems of the livestock products** and ask for the indication of extrinsic attributes (e.g. sustainability and animal welfare).

Some results were also presented in other different forums:

- a) "Journées de la Recherche Avicole et des Palmipèdes à Foie Gras". Organised in France with the support of two international poultry associations: World's Poultry Science Association (WPSA) and the World Veterinary Poultry Association (WVPA).
- b) "Roundtable with EU-funded projects PATHWAYS, mEATquality and Code:Re-Farm" (March 21, 2023).
- c) "26th Rencontre Recherche Ruminants". This is a scientific conference for all stakeholders in the ruminant sector. One oral communication based in the peer reviewed article entitled *Assessment of French multi-actors' expectations on milk and dairy products quality and authentication* (http://www.journees3r.fr/IMG/pdf/texte_2_qualite_des_produits_f-albert.pdf) were presented in the session "Assessment of French multi-actors' expectations on quality and authentication of milk and dairy products". The main outputs of 17 qualitative interviews that were led in France with stakeholders were the following: i) The extrinsic factors of naturalness, environment, animal welfare, social aspect and rearing conditions were cited spontaneously, as well as the organoleptic, safety, technological and nutritional criteria, referred as intrinsic dairy product quality. ii) dairy products substitution by vegetal products or synthetic products represents a real threat to some of the stakeholders.



Lead partner

INSTITUT NATIONAL DE RECHERCHE POUR L'AGRICULTURE, L'ALIMENTATION ET L'ENVIRONNEMENT (INRAE). France. Governmental organisations.



Other partners

Belgium (1. UNIVERSITEIT GENT), France (1. ACTA ASSOCIATION DE COORDINATION TECHNIQUE AGRICOLE - LES INSTITUTS TECHNIQUES AGRICOLES; 2. SYNDICAT DES SELECTIONNEURS AVICOLES ET AQUACOLE FRANCAIS; 3. ECOLE NATIONALE SUPERIEURE DES SCIENCES AGRONOMIQUES DE BORDEAUX AQUITAINE; 4. SOCIETE LDC; 5. SODIAAL INTERNATIONAL SOCIETE DE DIFFUSION INTERNATIONALE AGROALIMENTAIRE; 6. INSTITUT TECHNIQUE DE L'AVICULTURE DE LA CUNICULTURE ET DE LA PISCICULTURE-ITAVI; 7. INRAE TRANSFERT SAS; 8. INSTITUT DE L'ELEVAGE), Germany (1. BUNDESINSTITUT FUER RISIKOBEWERTUNG), Ireland (1. TEAGASC - AGRICULTURE AND FOOD DEVELOPMENT AUTHORITY), Italy (1. GESCO. SOCIETA COOPERATIVA AGRICOLA; 2. CONSORZIO DEL FORMAGGIO PARMIGIANO-REGGIANO; 3. FEDERAZIONE EUROPEA DI ZOOTECNICA; 4. UNIVERSITA DEGLI STUDI DI PERUGIA; 5. ALMA MATER STUDIORUM - UNIVERSITA DI BOLOGNA; 6. UNIVERSITA DEGLI STUDI DI PADOVA), Poland (1. FUNDACJA INTERNATIONAL MEAT RESEARCH 3G FOUNDATION), Portugal (1. CONSULAI, CONSULTORIA AGROINDUSTRIAL LDA), Spain (1. UNIVERSIDAD DE EXTREMADURA), Switzerland (1. LINUS SILVESTRI AG; 2. FORSCHUNGSINSTITUT FUR BIOLOGISCHEN LANDBAU STIFTUNG), United Kingdom (1. THE QUEEN'S UNIVERSITY OF BELFAST).

10 countries represented by **23 partners** coming from: Belgium, France, Germany, Ireland, Italy, Poland,

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Relevant links

- <https://www.youtube.com/channel/UCHIYVxseo1QmA28RdWWehoA>
- <https://www.facebook.com/h2020intaqt/>
- https://www.linkedin.com/company/h2020-intaqt/%20?original_referer=https%3A%2F%2Fh2020-intaqt.eu%2F
- https://twitter.com/H2020_INTAQT Links__social_media»



Relation to the WG meeting

For the CWG SAP, the challenges that sustainable animal production is facing can only be tackled by using a systems approach and by taking into account all actors of the value chain (multi-actor approach). INTAQT will involve a **multi-actor participatory approach** to improve husbandry practices complying with the high quality of animal products: unprocessed and processed ready-to-eat chicken meat, beef and dairy products stemming from husbandry systems of different European countries from **both extensive and intensive husbandry systems**.

Overlaps and gaps in the content compared to the other projects

The **INTAQT** project aims at improving husbandry practices by using a **multi-actor approach**. Regarding to the SusAn CSRIA, Area 5 is more developed in this project. In the final report, an in-depth analysis and discussion of overlaps and gaps is provided.

10) Pathways for transitions to sustainability in livestock husbandry and food systems - Pathways MA



Source(s)

CORDIS (<https://cordis.europa.eu/project/id/101000395>)
Project website: <https://pathways-project.com/>



Funding details

Source of funding: H2020-EU.3.2. - SOCIETAL CHALLENGES - Food security, sustainable agriculture and forestry, marine, maritime and inland water research, and the bioeconomy
Type of project (+ cluster if relevant): RIA - Research and Innovation action
Contract number: 101000395

Project total budget: € 9 026 907,49



Start and end date of the project

01/09/2021 - 31/08/2026



Project summary

PATHWAYS is an ongoing project whose overarching aim is to “inform policy, research and business strategies in support of a transition to more sustainable livestock production and consumption”. It aims at delivering co-developed transition pathways that directly address **societal demands for increased resilience in the provision of safe, nutritious, affordable livestock-based food, whilst reducing environmental impacts and supporting the economic sustainability of the European livestock sector**. Visions, scenarios and transition pathways will be co-developed through an ambitious participatory approach based on innovative practice hubs, living labs and interaction within a European multi-actor platform and a wider community of practice.

Existing and future, co-designed livestock systems will be characterized and assessed within a scientifically **robust, sustainable and holistic framework**, comprising refined key performance indicators and cutting-edge models, to enhance understanding of **productivity, biodiversity, health and welfare, greenhouse gas emissions, human nutrition, trade and economics, and ecosystem service impacts**. Living labs and practice hubs will identify bottom-up interventions and adopt routes that will drive a transition towards improved livestock system development. **Consumer preferences**, diet choices and willingness to pay will be supported by economic analysis of trade, addressed through stakeholder input and modelling.

The **participatory development and application of a holistic sustainability assessment** will deliver a scientifically robust analysis for the co-development of scenarios and transition pathways to inform key stakeholders throughout livestock-based food systems, driving a **transition to greater sustainability**. Additionally, Pathways will **improve the role of livestock in supporting a circular bioeconomy and the place of animal products** in future diets through an

interactive online platform and policy toolkit to provide user-friendly instruments for a range of stakeholders.

All in all, the PATHWAYS project will **identify and promote sustainable practices along the supply and production chains of the European livestock sector**. The project's work will **increase the role of livestock in a circular bioeconomy** and further provide an interactive online platform and policy toolkit for various stakeholders.



Project results

With the aim of reducing environmental impacts while addressing societal demands for safe, nutritious and affordable meat and dairy products, PATHWAYS is about identifying and increasing sustainable practices along the supply and production chains of the European livestock sector. Coordinated by the Swedish University of Agricultural Sciences (SLU) and comprising 28 partners from 12 countries, this 5-year (2021-2026) €9 million Horizon 2020 project contributes to the EU Farm-to-Fork Strategy which is at the heart of the EU Green Deal.

Started in 2021, PATHWAYS has no published results yet. However, the project will provide significant results in the field of sustainable animal production in Europe and therefore it is important to know their objectives and track their steps throughout the whole period. During the first CWG First General Meeting in 2023, a member of PATHWAYS was invited to give a talk about the objectives and the work in progress of the project. Specifically, the **main objectives of the project are:**

1. To develop **innovative holistic sustainability assessment** methodologies to enable livestock systems assessments from farm to fork.
2. To **identify and evaluate innovations within livestock systems** through practice hubs and stakeholder engagement.
3. To **co-design scenarios and associated transition pathways with multi actors** for a sustainable European livestock sector
4. To **support a timely effective transition** to sustainable livestock systems in Europe

The project is structured in **9 working packages** with **four key components:**

1. Practice hubs:

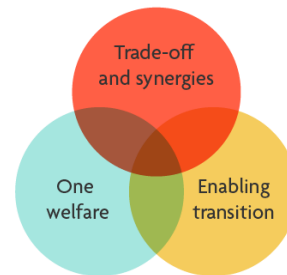
Organisation for Economic Cooperation and Development (OECD)

- National groups of farmers organised around four OECD areas of innovation
- Led by industry partners in collaboration with a Facilitator
- Each hub is an innovative case-study for identifying “configurations that work” in a specific context

2. European multi-actor platform:

European multi-actor platform

- NGOs
- Pre-farm gate industry (nutrition, breeding, health, technology, farm advice companies)
- Post farm gate industry (processors, retailers)
- Consumer associations
- DG AGRI, ENVI, RTD, Clima
- Researchers



3. Living labs:

- Small-scale projects set-up within Practice hubs to test cutting-edge innovations
- Up to 15 projects across 11 countries
- Approx. 15k EUR per project
- Selection of projects based on:
 - Feasibility of completion within the project timeframe
 - Total cost
 - Reproducibility/transferability
 - Equipment / machinery / skill availability
 - Coverage of the countries/agri-climatic zones /species / production areas

4. Community of practice:

- ✂ A forum involving several hundred international and national stakeholders
- ✂ Covering the diversity of livestock systems
- ✂ Will be engaged in a broader societal debate about the role of livestock in European society
- ✂ Engagement through:
 - Open spaces in general meetings
 - Webinars, events
 - Blogs
 - Social media

In summary, PATHWAYS will support the transformation of Europe's food system through active industry engagement and robust science. It will also deliver co-developed transition pathways that directly address societal demands. Finally, it will establish regular engagement with project processes that will maximise synergies and ensure the projects impact.



Lead partner

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Other partners

Belgium (1. REVOLVE MEDIA; 2. VRIJE UNIVERSITEIT BRUSSEL; 3. UNIVERSITEIT GENT; 4. UNION EUROPEENNE DU COMMERCE DU BÉTAIL ET DE LA VIANDE), Denmark (1. AARHUS UNIVERSITET; 2. LANDBRUG & FODEVARER F.M.B.A.; 3. ARLA FOODS AMBA), France (1. FONDATION INSTITUT DE RECHERCHE POUR LE DÉVELOPPEMENT DURABLE ET LES RELATIONS INTERNATIONALES; 2. IFIP-INSTITUT

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Relevant links

- <https://pathways-project.com/>
- https://twitter.com/Pathways_europe
- https://www.linkedin.com/company/pathways-h2020/about/?original_referer=https%3A%2F%2Fpathways-project.com%2F



Relation to the WG meeting

This project is focused on generating “pathways” with the aim of improving sustainability in the European livestock sector. It includes activities directly related to **resilience, circular economy, or reduction of environmental impacts, always from a holistic perspective**. These topics are within the scope of the CWG SAP which is looking into the future of sustainable animal production from a holistic point of view, considering the environmental impact, and different ways of increasing animal productivity (efficiency) while keeping sustainability. Importantly, an invited speaker (member of this project) has participated in the first general meeting of the CWG (2023) and explained in detail the objectives of the project for the coming years – thus, proving the importance of this project to the CWG. **A track of**

the upcoming results of the project is of paramount to be able to keep up to date with the latest news/discoveries in the field.

Overlaps and gaps in the content compared to the other projects

Pathways focuses on a relevant theme, **which is to define new pathways to improve the European livestock sector from a sustainable and holistic point of view.** Regarding to the SusAn CSRIA, Area 1 is more developed in this project. In the final report, an in-depth analysis and discussion of overlaps and gaps is provided.