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## **PPILOW: Innovations for improving welfare in low-input outdoor and organic pig and poultry farms**

Anne Collin, Jarkko Niemi, Martina Re, Frank A.M. Tuyttens, Evelien Graat, Charlotte Vanden Hole, Laura Warin, T. Bas Rodenburg, Sarah Lombard, Claire Bonnefous, et al.

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## Innovations for improving welfare in low-input outdoor and organic pig and poultry farms

*Anne Collin, Jarkko Niemi, Martina Re, Frank Tuyttens, Evelien Graat,  
Charlotte vanden Hole, Laura Warin, T. Bas Rodenburg, Sarah Lombard, Claire Bonnefous,  
Elisabeth Le Bihan-Duval, Sophie Réhault-Godbert, Sanna Steinfeldt, Petra Thobe, Marlene Sciarretta,  
Riccardo Carelli, Monica Coletta*

*EAAP Webinar: Impacts of Poultry European projects – 2024-04-16*





## Why is it important to consider welfare in low-input outdoor and organic farming systems?

- High quality of the rearing practices and of the products
- Diversity of practices throughout Europe
- Still a need to improve animal welfare and limit mortality, in relation to the outdoor access challenging the animals, ethical issues, the wish of practitioners and societal expectations

Objective of PPILOW: Identify, test and evaluate animal welfare-improving practices by taking into account environmental, economic and social impacts including human well-being

*One Welfare concept (Garcia Pinillos et al., 2016)*

# H2020 PPILOW partners and collaborators



**PPILOW**

Poultry and Pig Low-input and Organic production systems' Welfare

2019-2024



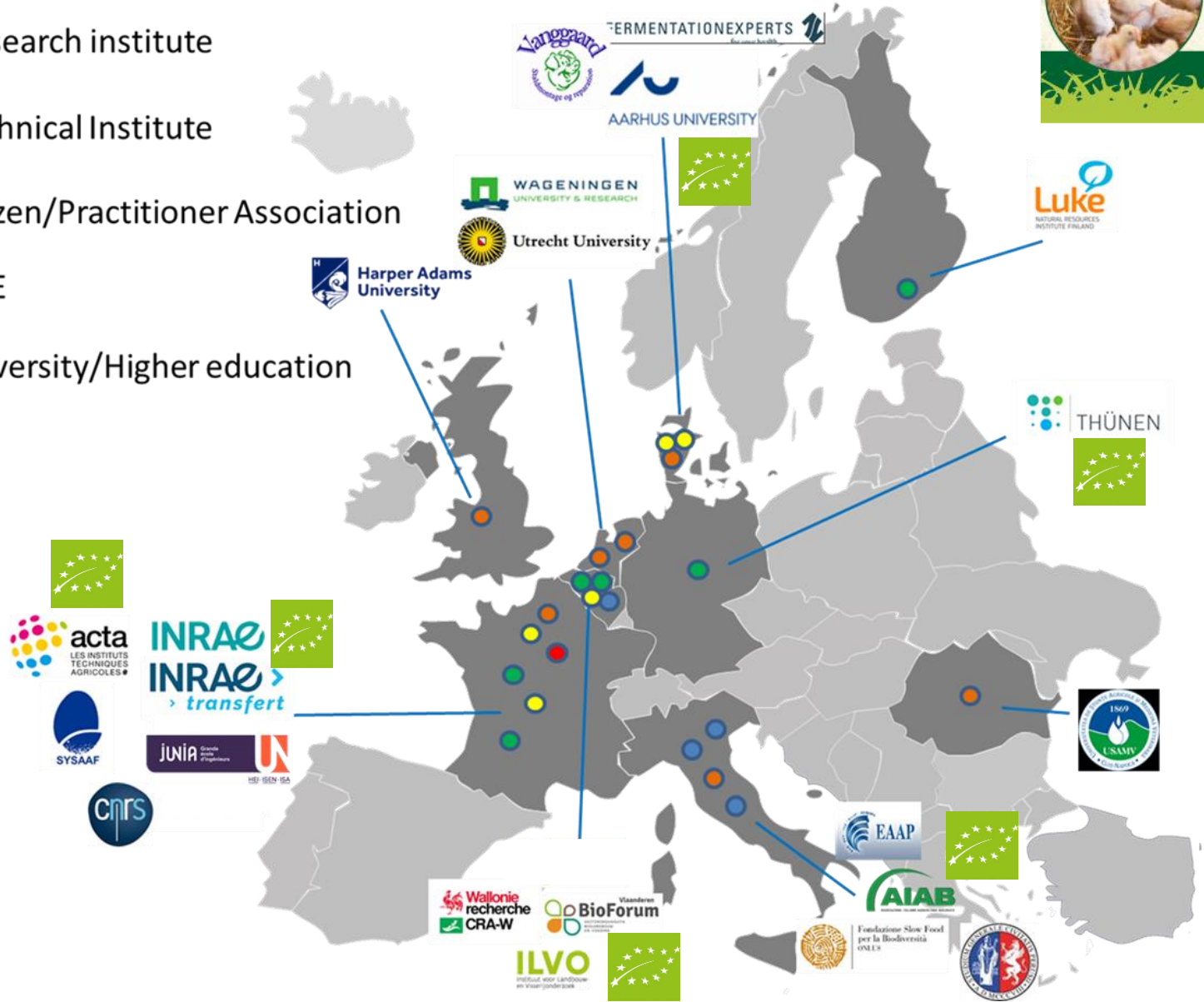
Coordination: **INRAE**

**22 PPILOW Partners in 9 countries**

**9 National Practitioner Groups (NPG): 4 dedicated to pigs and 5 to poultry**

[www.ppilow.eu](http://www.ppilow.eu)

- Research institute
- Technical Institute
- Citizen/Practitioner Association
- SME
- University/Higher education



# PPILOW Involvement of National Practitioner Groups

## Innovative breeding and rearing strategies



*Favouring positive behaviours, improving health and robustness*

*Avoiding feather pecking in non beak-trimmed hens and the elimination of layer male chicks*



# PPILOW Impact generated by the project

## - Knowledge base for further improvements in animal welfare management and policy making

Practice Abstract n. 5



Stakeholders' views regarding the key challenges in organic and low-input pig farming

Practice Abstract n. 6



Perceived usefulness and feasibility of measures to enhance animal welfare in organic and outdoor-reared pigs and poultry

Review of European Pig and Poultry Productions Systems and Marketing Labels Elaborating Animal Welfare

Jarkko K. Niemi<sup>1</sup>, Katrina Heinola<sup>1</sup>, Minna Väre<sup>1</sup>, Claire Bonnefous<sup>1</sup>, Lisa Baldinger<sup>2</sup>, Vasilie Cozma<sup>3</sup>, Virginie Decruyenaere<sup>4</sup>, Jonathan Hercule<sup>5</sup>, Sophie Herremans<sup>6</sup>, Christine Leterrier<sup>7</sup>, Antoine Roinsard<sup>8</sup>, Patricia Parrott<sup>9</sup>, Petra Thobe<sup>7</sup> and Anne Collin<sup>1</sup>



frontiers | Frontiers in Veterinary Science

TYPE Review  
PUBLISHED 05 August 2022  
DOI: 10.3389/fvets.2022.952922

Check for updates

Welfare issues and potential solutions for laying hens in free range and organic production systems: A review based on literature and interviews

Claire Bonnefous<sup>1</sup>, Anne Collin<sup>1</sup>, Laurence A. Guilloteau<sup>1</sup>, Vanessa Guesdon<sup>2</sup>, Christine Filiat<sup>1</sup>, Sophie Réhault-Godbert<sup>1</sup>, T. Bas Rodenburg<sup>4</sup>, Frank A. M. Tuytens<sup>5,6</sup>, Laura Warin<sup>7</sup>, Sanna Steinfeldt<sup>8</sup>, Lisa Baldinger<sup>9</sup>, Martina Re<sup>10</sup>, Raffaella Ponzio<sup>11</sup>, Anna Zuliani<sup>12</sup>, Pietro Venezia<sup>12</sup>, Minna Väre<sup>13</sup>, Patricia Parrott<sup>14</sup>, Keith Walley<sup>14</sup>, Jarkko K. Niemi<sup>15</sup> and Christine Leterrier<sup>16\*</sup>

OPEN ACCESS

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SPECIALTY SECTION  
This article was submitted to Animal Behavior and Welfare, a section of the journal Frontiers in Veterinary Science

SCHOLARONE<sup>™</sup> Manuscripts

Consumers' views on egg quality and preferences for responsible production – Results from nine European countries

Journal:	British Food Journal
Manuscript ID:	BFJ-03-2023-0183
Manuscript Type:	Research Paper
Keywords:	Egg consumption, Food quality, Sustainability attributes, Responsible production

LUKE, HAU, Thuenen Institute, INRAE and all PPILOW collaborators

## - Contribution to a better understanding of animal welfare and associated animal behaviour

Knowledge on the adaptability of poultry breeds to the use of outdoor area depending on their cognitive capacities and genetic, physiological, metabolic background and rearing conditions for proposing innovating levers for welfare improvement

frontiers in Veterinary Science

ORIGINAL RESEARCH  
PUBLISHED 07 February 2022  
DOI: 10.3389/fvets.2022.814034

Foraging Behavior Shows Individual-Consistency Over Time, and Predicts Range Use in Slow-Growing Free-Range Male Broiler Chickens

OPEN ACCESS

Vitor Hugo Bessa Ferreira<sup>1,2,5\*</sup>, Arthur Simon<sup>1,2,5</sup>, Karine Germain<sup>3</sup>, Christine Leterrier<sup>6</sup>, Léa Lansade<sup>4</sup>, Anne Collin<sup>4</sup>, Sandrine Mignon-Grasteau<sup>4</sup>, Elisabeth Le Bihan-Duval<sup>4</sup>, Elodie Guettier<sup>4</sup>, Héléne Leruste<sup>4</sup>, Marine Louve<sup>4</sup>, Ludovic Calandreau<sup>4</sup> and Vanessa Guesdon<sup>1,6</sup>

scientific reports

Check for updates

OPEN Working for food is related to range use in free-range broiler chickens

Vitor Hugo Bessa Ferreira<sup>1,2,5\*</sup>, Arthur Simon<sup>1,2,5</sup>, Karine Germain<sup>3</sup>, Christine Leterrier<sup>6</sup>, Léa Lansade<sup>4</sup>, Anne Collin<sup>4</sup>, Sandrine Mignon-Grasteau<sup>4</sup>, Elisabeth Le Bihan-Duval<sup>4</sup>, Elodie Guettier<sup>4</sup>, Héléne Leruste<sup>4</sup>, Ludovic Calandreau<sup>4,6</sup> & Vanessa Guesdon<sup>1,6</sup>

PLOS ONE

RESEARCH ARTICLE

Intake of nutrients (polyunsaturated fatty acids, tocopherols, and carotenoids) and storage efficiency in different slow-growing chickens genotypes reared in extensive systems

Simona Mattioli<sup>1\*</sup>, Alice Carloni Mancinelli<sup>1</sup>, Alessandro Dal Bosco<sup>1</sup>, Claudia Ciarelli<sup>2</sup>, Monica Guarino Amato<sup>3</sup>, Elisa Angelucci<sup>4</sup>, Diletta Chiattelli<sup>5</sup>, Cesare Castellini<sup>1</sup>

Applied Animal Behaviour Science 260 (2023) 105870

Contents lists available at ScienceDirect

Applied Animal Behaviour Science

journal homepage: [www.elsevier.com/locate/applanim](http://www.elsevier.com/locate/applanim)

Behavioural indicators of range use in four broiler strains

Claire Bonnefous<sup>1\*</sup>, Ludovic Calandreau<sup>2</sup>, Elisabeth Le Bihan-Duval<sup>3</sup>, Vitor Hugo Bessa Ferreira<sup>4,5</sup>, Alexandre Barbin<sup>6</sup>, Anne Collin<sup>6</sup>, Maxime Reverchon<sup>5</sup>, Karine Germain<sup>6</sup>, Laure Ravon<sup>4</sup>, Nina Kruger<sup>7</sup>, Sandrine Mignon-Grasteau<sup>4,1</sup>, Vanessa Guesdon<sup>1,1</sup>



# PPILOW Impact generated by the project

## - Broader range of animal welfare management strategies and tools

Management strategies to **avoid feather pecking** in non-beak-trimmed laying hens

*Utrecht University, WUR, ILVO*



*Effects of green light in the setter-hatcher and of insect larvae for chicks;*

*Management of the free range and design of the barn: foraging and exploration behaviours and avoid fearfulness*

Management, and nutrition strategies and techniques aiming at **preventing diseases, parasitic risk, improving incubation and early-life conditions**, and selection tools to improve animal robustness

**Incubation conditions and early life management for improving resilience in slow-growing chickens (WU, INRAE, ILVO, UU)**



- Incubation temperatures for improving the resilience of slow-growing broilers



- Field studies: on-farm hatching in label-type and organic farms from the French National Practitioner Group

*WUR, ILVO, Utrecht University, INRAE, Aarhus University*

- Test of fermented or treated feeds for preventing pathologies in laying hens

# Anticipation of National legislations and knowledge for practitioners and European policy makers: Alternatives to the elimination of layer male chicks



Layer strain

*Selection based on egg production, egg quality traits*

~~Culling of layer male chicks~~

**FR: Article R214-17**

- From 01/01/2023 : all hatcheries have to be equipped with operational material to avoid culling chick  
 -> Special case when it is not possible to respect the decree (white strains)

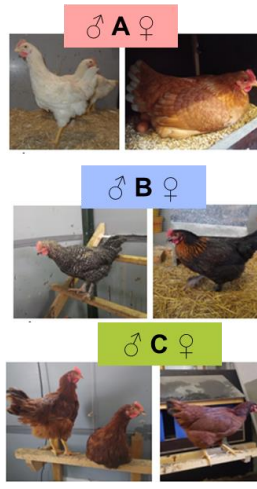
**DE: Article TierSchtG Art. 1 § 4c**

- From 01/01/2022 : makes it a punishable offence to kill a vertebrate animal "without reasonable cause" (unprofitability) or to cause it suffering and pain

## Two strategies developed in PPILOW

- Study of dual-purpose strains experimentally and on-farm

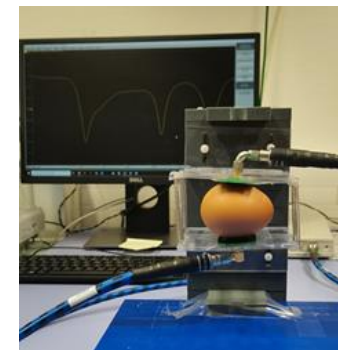
Multiperformance data, multicriteria analysis and business models



ACTA(ITAB)  
 Thuenen  
 Institute  
 Aarhus  
 University  
 INRAE  
 SYSAAF

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- Development of an on-ovo sexing tool:  
*Non invasive method*  
*As early as possible*



Open Access Article

**Dual-Purpose Poultry in Organic Egg Production and Effects on Egg Quality Parameters**

by Marianne Hammershøj<sup>1,\*</sup>, Gitte Hald Kristiansen<sup>1</sup> and Sanna Steinfeldt<sup>2</sup>

<sup>1</sup> Department of Food Science, Aarhus University, Agro Food Park 48, DK-8200 Aarhus, Denmark

<sup>2</sup> Department of Animal Science, Aarhus University, Blichers Alle 20, DK-8830 Tjele, Denmark

\* Author to whom correspondence should be addressed.



# PPILOW Impact generated by the project

## Technological innovations

- Co-development of tools for **welfare self-assessment** in pigs and poultry :

*extension of the EBENE® app and development of the PIGLOW app*

ILVO, ITAVI, UU, JUNIA, INRAE

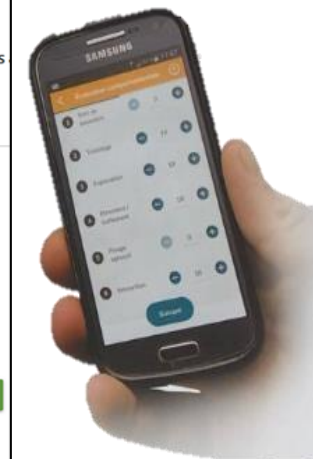
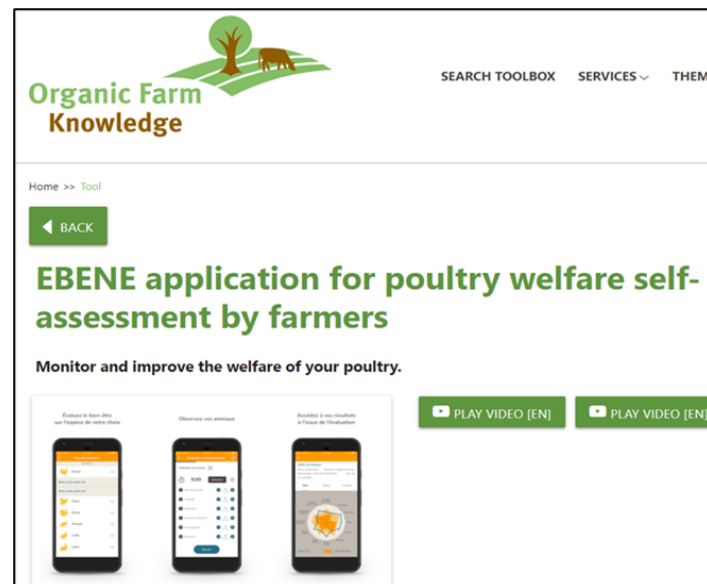
Already 984 EBENE® evaluations in 2023

2021 - 2023: 340 assessments for outdoor broilers and 390 for outdoor laying hens – feedbacks from farmers

- Provision for sustainability conceptual framework according to the One Welfare concept (*Garcia Pinillos et al., 2016*):

*Inclusion of an Animal Welfare pillar in the Assessment grids for Multicriteria analyses*

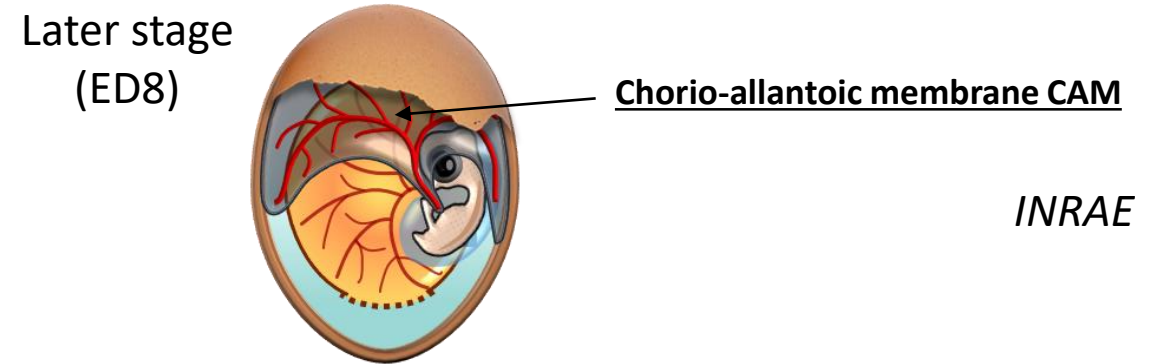
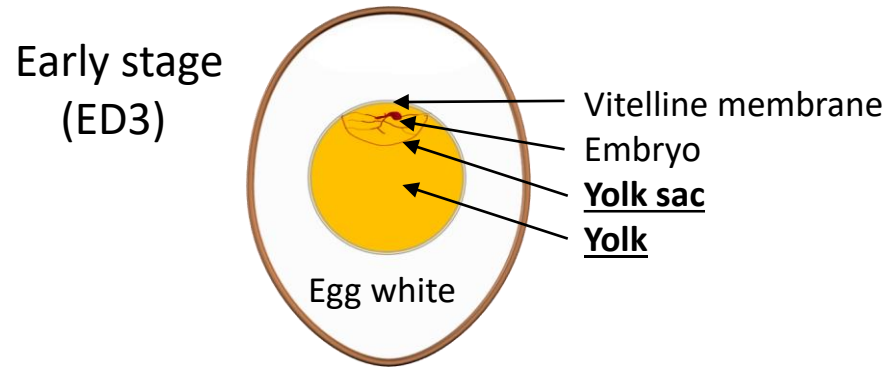
UNIPG and partners



SUSTAINABILITY PILLAR	ONE WELFARE DIMENSIONS
<b>Society</b>	Working conditions for farmer
	Job perception
	Job motivation
	Connection with territory
	Social Acceptance
<b>Animal Welfare</b>	Good Feeding
	Good Environment (Housing)
	Good Health
	Appropriate Behaviour
	Depopulation
<b>Economy</b>	Performance- quantity
	Performance- quality
	Returns
	Costs
<b>Environment</b>	Enhance biodiversity
	Reduce pollution (soil, air, water)
	Minimize external resources used

## Provision of in-ovo sexing tool

Early markers of male and female embryos in egg contents and extra-embryonic membranes

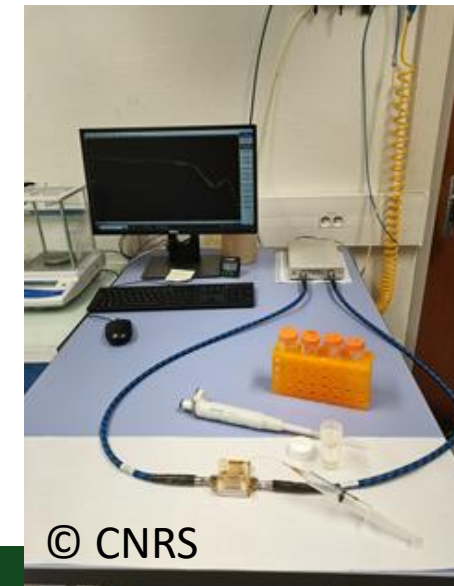


Molecular profiles: markers of sex during the first week of incubation

Development of a new radio-frequency based method for “on-ovo sexing”

Millifluidic Sensor

*Second generation of in-ovo sexing tools*



# PPILOW Poultry production issues addressed and the follow up status



Use of the  
PIGLOW and  
EBENE welfare  
self-assessment  
applications



Longitudinal field studies  
ILVO, ITAVI, UU

Country	NPG	Overview of the innovations implemented on-farm
NL	Poultry	Working on <b>feather pecking and dual-purpose genotypes</b> with a group of farmers and a coop with a focus on layers
DE		<b>Broilers from dual-purpose genotype</b> started from December 2021 to March 2022 and on-farm trial are still on-going 🇪🇺
FR		<b>Broilers from dual-purpose genotype</b> were reared in France (December 2021 – March 2022). <b>Laying hens of one PPILOW dual-purpose genotype</b> have been reared on the same farm since April 2022. 🇪🇺
DK		Pullets from <b>two dual-purpose genotypes</b> reared in France were then tested on-farm in Denmark. One farmer expressed interest in the dual-purpose genotypes during NPG-meetings and received <b>young hens</b> from two genotypes for the trial 🇪🇺
FR		On-farm <b>hatching of slow-growing chicks</b> tested 🇪🇺
DE		The testing of <b>on-farm hatching</b> is in the planning phase 🇪🇺
DK		On-farm study <b>with laying hens to test the most promising plant or plant extracts</b> on intestinal infections with especially <i>Ascaridia galli</i> .
DE		The testing of a product from <b>Fermentation Experts company</b> is in the planning phase
NL_BE		<b>Alternatives to anthelmintics</b> (planning phase)

AIAB and partners

# PPILOW Raising awareness, technical days and training, information for practitioners and policy makers

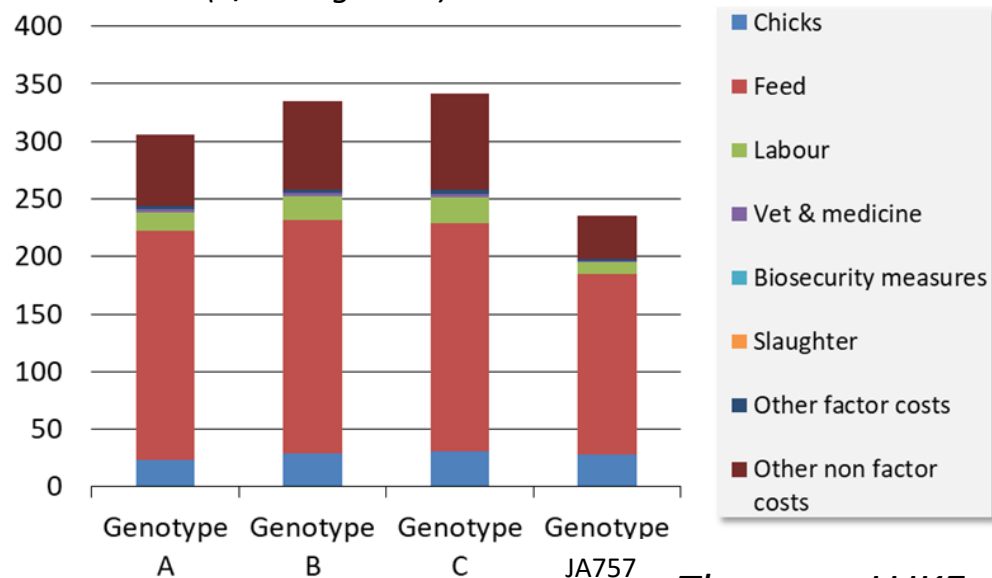
[www.ppilow.eu](http://www.ppilow.eu)

EAAP, AIAB and partners

**Provision of multicriteria analyses** for breed x outdoor run types (agroforestry) and the use of dual-purpose breeds

**Business models** concerning on-farm hatching, the use of different broiler breeds in organic systems, the use of dual-purpose breeds and of the on-ovo sexing tool

Production costs (€/100 kg meat)



Thuenen, LUKE, UNIPG

Additionally to scientific communications and publications...

16 Practice Abstracts (EU CAP Network)

7 videos on PPILOW strategy and innovations

8 PPILOW newsletters

Workshops with policy makers and practitioners: 10

Training and technical days : 6

PPILOW Autumn school 2023 (18 presentations)

Webinars (dedicated to poultry):

- On-farm hatching
- Alternatives to the elimination of layer male chicks
- To come: early management levers for increasing resilience

Around 90 practitioners involved  
in PPILOW multiactor groups

**More research and development on dual-purpose breeds needed for:**

- Adapting nutrition using alternative feeds for lower production costs
- Product marketing (smaller carcasses) and communication towards consumers and citizens



**Early indicators of range use in broilers: *interest as selection tools for practitioners?***

**Test of new incubation thermal programs in commercial hatcheries**

**Refinement of EBENE app from practitioners' feedback**

**Refinement of in-ovo sexing tools for industrial use (2<sup>nd</sup> generation)**



***How to raise organic broiler breeders and pullets with outdoor access? How to conciliate welfare and biosecurity?***

**Contributions to the recently launched EUP Animal Health and Welfare and to EU BroilerNet project**

- Welfare self-assessment tools and indicators, welfare issues and best practices
- Sustainability assessment methods enlarged to animal welfare criteria



**Complementary information needed on indicators at slaughter house (EU aWISH project)  
and on product quality (EU INTAQT project)**



**Contribution to knowledge for policy makers concerning further labelling and AW policies**

# PPILOW PARTNERS



Fondazione Slow Food  
per la Biodiversità  
ONLUS



Harper Adams  
University



Utrecht University



*Thanks for your attention!*

[www.ppilow.eu](http://www.ppilow.eu)