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

"The project PPILOW has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°816172".

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

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

PPILOW partners and collaborators

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

2019-2024

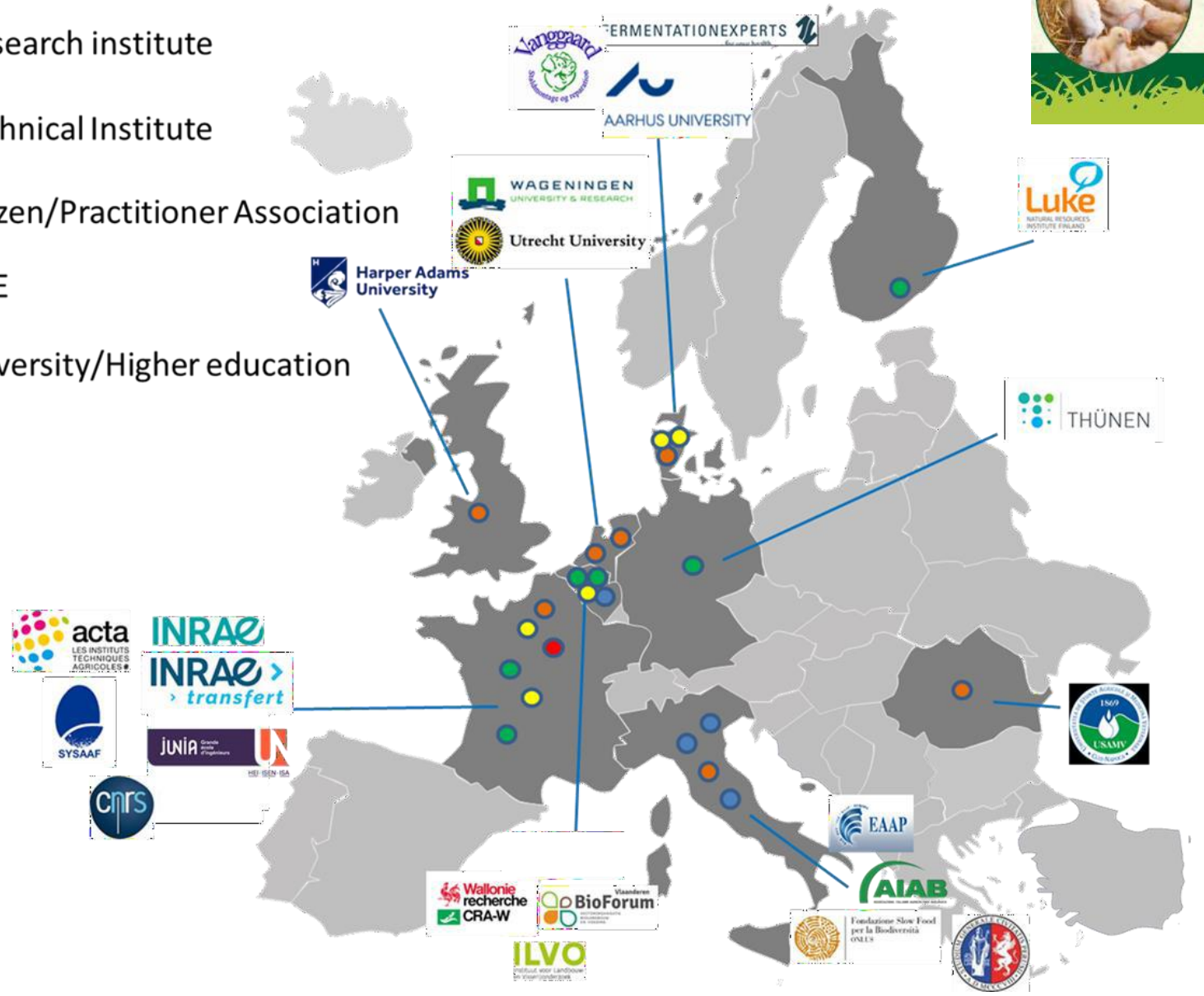
Coordination: INRAE

22 PPILOW Partners in 9 countries

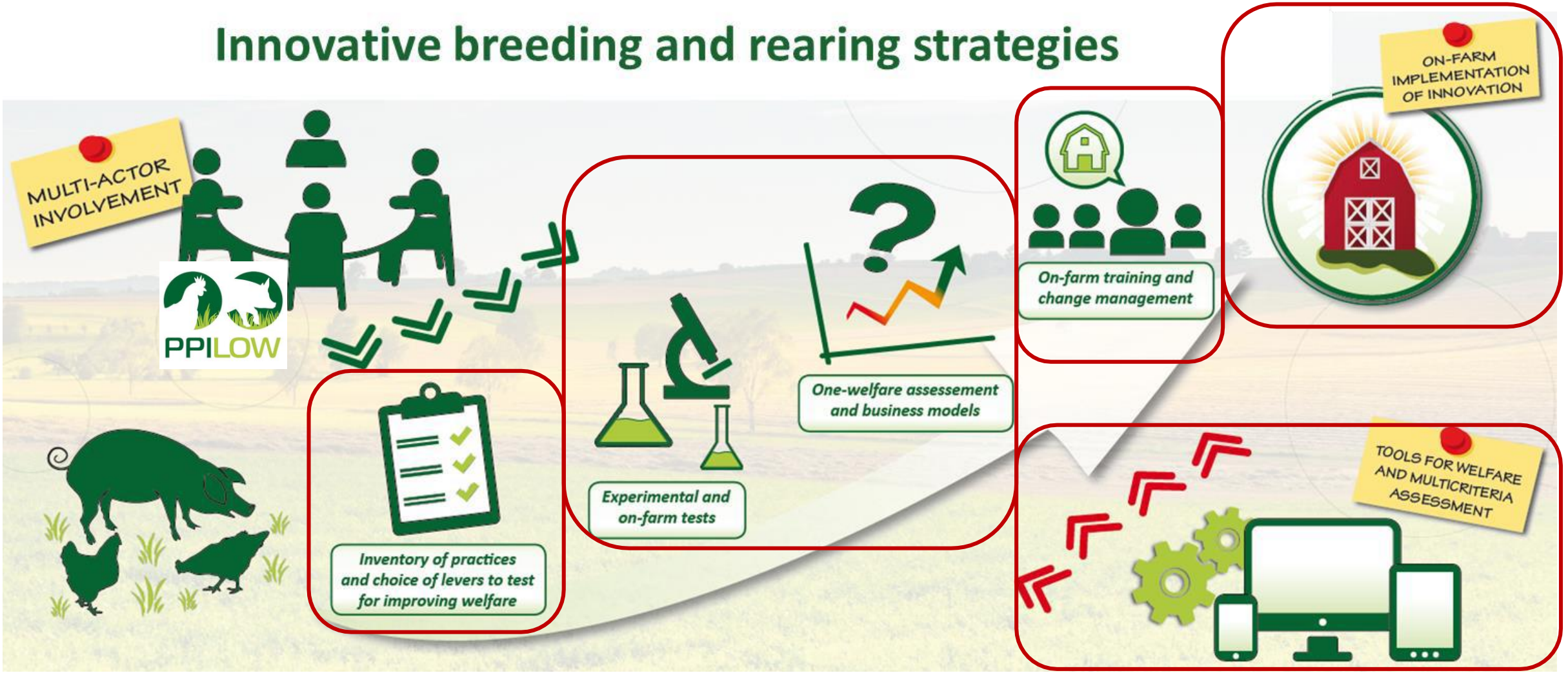
9 National Practitioner Groups (NPG): 4 dedicated to pigs and 5 to poultry

www.ppilow.eu

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



PPILOW Involvement of National Practitioner Groups



Favouring positive behaviours, improving health and robustness

Avoiding piglet castration, beak trimming, the elimination of layer male chicks

PPILOW Organisation

Barriers to animal welfare and choice of levers to be tested WP1

Tools for the evaluation of welfare and sustainability WP3

Society and field expectations

Experiments and field studies

WP4

- Limit damages to pig and poultry physical integrity
- Find alternatives to the elimination of layer male chicks WP5
- Improve robustness, health and exploration behaviours WP6

Tool selection

Participative approach

WP2 Multiactor groups

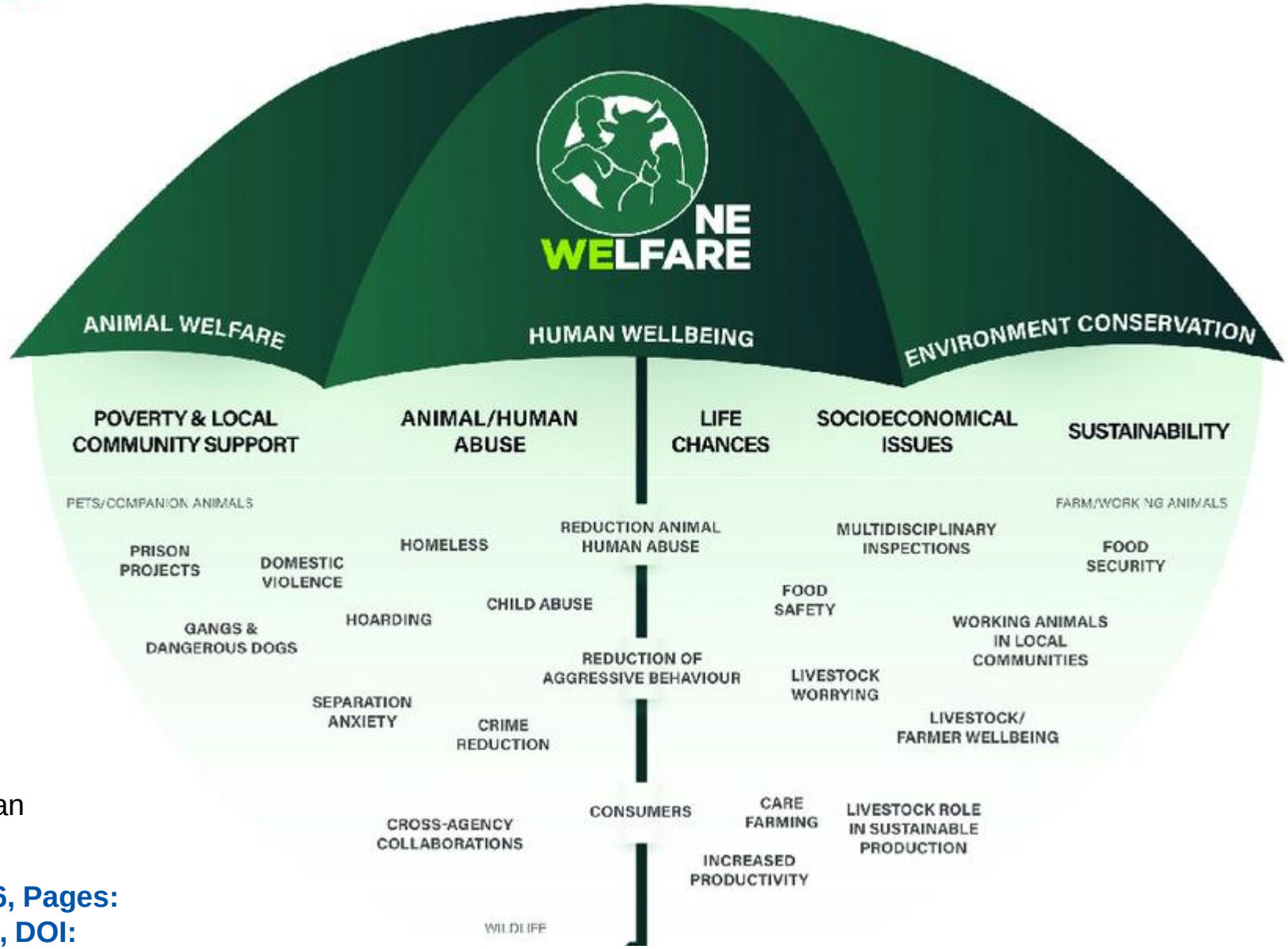
Co-creation

Multicriteria analyses of combined levers and business models WP7

Knowledge and tool transfer

WP8 Dissemination and communication

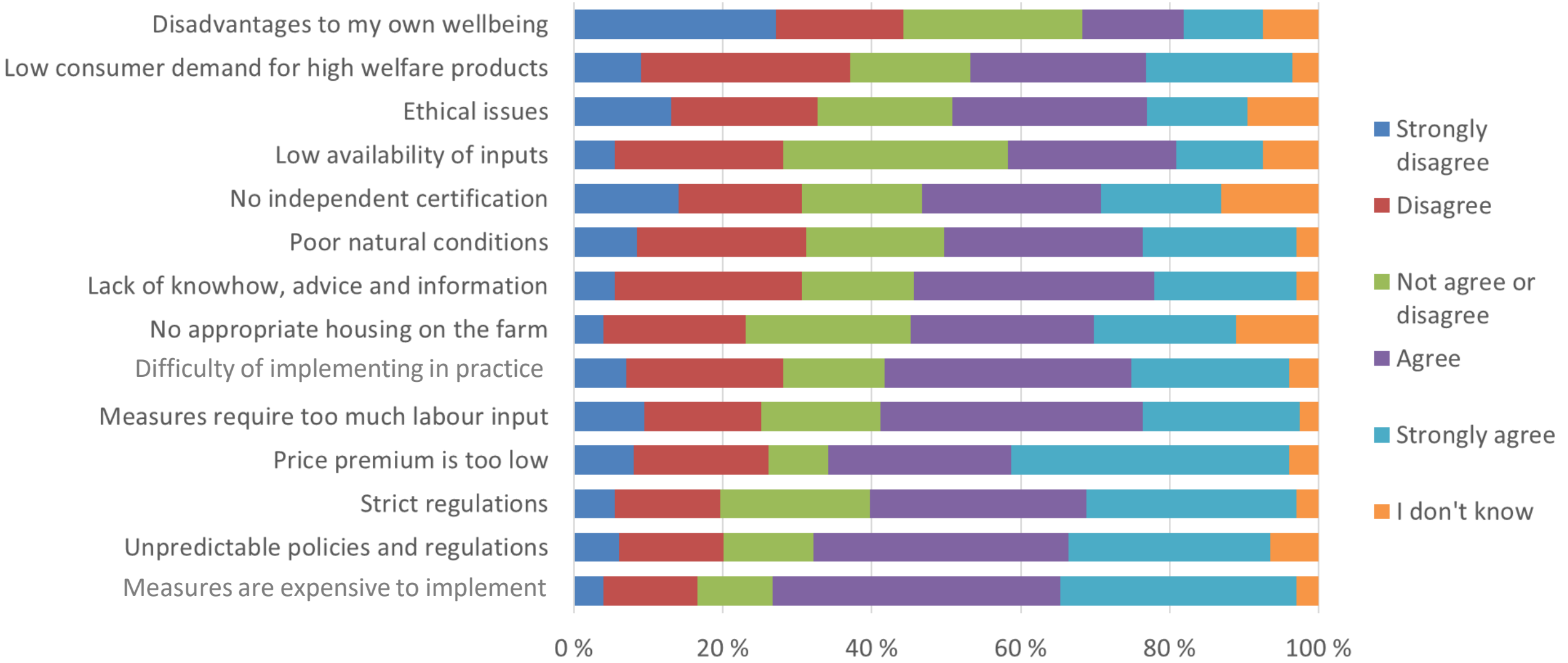
WP9-10 Coordination, management, and Ethics



One Welfare – a platform for improving human and animal welfare

Veterinary Record, Volume: 179, Issue: 16, Pages: 412-413, First published: 22 October 2016, DOI: (10.1136/vr.i5470)

Stakeholder survey: the main barriers to improving animal welfare in organic pig and poultry production



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 816172

PPILOW **outputs**

Barriers to animal welfare and choice of levers to be tested **WP1**

frontiers | Frontiers in Veterinary Science

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Check for updates

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

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

Claire Bonnefous[1], Anne Collin[1], Laurence A. Guilloteau[1], Vanessa Guesdon[2], Christine Filliat[3], Sophie Réhault-Godbert[1], T. Bas Rodenburg[4], Frank A. M. Tuyttens[5,6], Laura Warin[7], Sanna Steenfeldt[8], Lisa Baldinger[9], Martina Re[10], Raffaella Ponzio[11], Anna Zuliani[12], Pietro Venezia[12], Minna Väre[13], Patricia Parrott[14], Keith Walley[14], Jarkko K. Niemi[15] and Christine Leterrier[16]*

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

SCHOLARONE™
Manuscripts

PPILOW Participative approach in WP2 led by AIAB (Italy)

Practitioners involved:

- Farmers
- Breeding companies
- Nutrition firms
- Equipment firms
- Slaughter houses & Processors
- Retailers
- Production organisations
- Veterinarians…

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AIAB, BioForum, UU, UNIPG, ACTA (ITAB, ITAVI, IFIP), CRAW, AU, INRAE, JUNIA, USAMV, Thuenen

©Thuenen

Different organisation scales depending on the country and production types

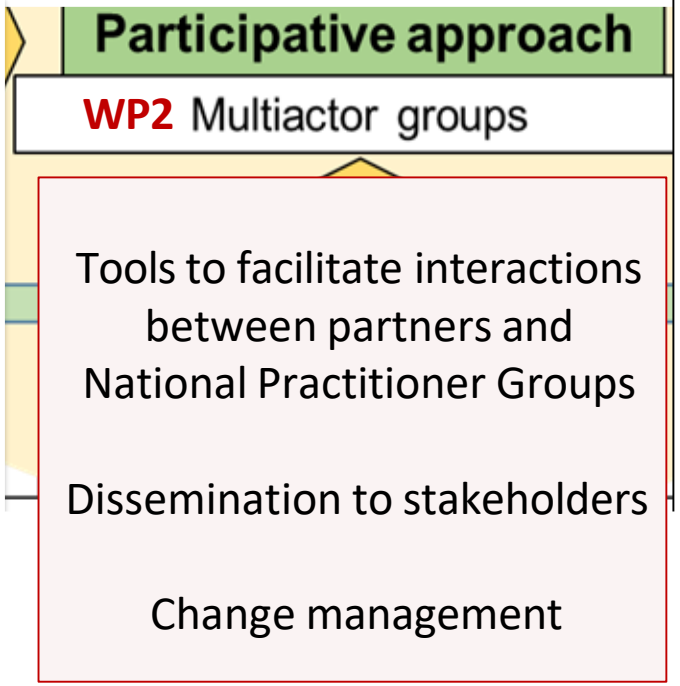
Other members of the society involved:

- Organic production syndicates, associations or federations
- Consumer associations
- Citizen associations, especially dedicated to animal welfare
- Policy makers

©USAMV Cluj

PPILOW **WP2**

- *Set-up of PPILOW practitioner groups*
- *Participation to the design of shared tools : Welfare self-assessement tools and One Welfare Multicriteria analysis tool (using deck card method*
- *Identification of levers for welfare improvement*
- *Participation to field studies*



Implementation of selected practices and change

- use of dual-purpose poultry breeds (FR, DK, DE)
- on-farm hatching (FR)
- new farrowing huts for sows reared outdoor (FR, IT, BE)
- use of plant extracts for avoiding pathologies in pigs (RO)
- use of the PIGLOW app for welfare self assessment in pig organic farms (FR, BE)
- …

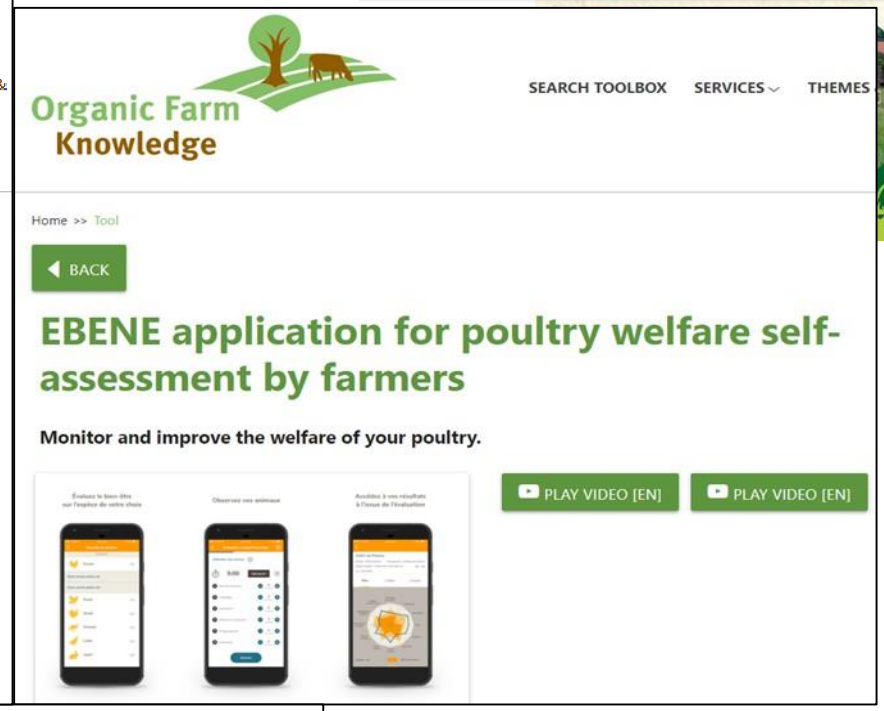
PIGLOW

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

PPILOW WP3
Led by ILVO
ILVO, ACTA(ITAVI, IFIP), UU, INRAE, AU, Thuenen, UNIPG, CRAW, BioForum, JUNIA

Tools for the evaluation of welfare and **WP3** sustainability

3.1 - Two applications for on farm welfare self-assessment PIGLOW and EBENE®



3.3- Tables for collecting experimental and farm data and grid for multicriteria One Welfare evaluations

Hierarchy of indicators with practitioners of WP2

SUSTAINABILITY PILLAR	ONE WELFARE DIMENSIONS
Animal Welfare (4)	Good Feeding
	Good Environment (Housing)
	Good Health
	Appropriate Behaviour
Environment (3)	Enhance biodiversity
	Reduce pollution (soil, air, water)
	Minimize external resources used
Economy (4)	Performance - quantity
	Performance - quality
	Returns
	Costs
Society (4)	Working conditions
	Job perception and motivation
	Connection with local community
	Social Acceptability

Use of the PIGLOW and EBENE welfare self-assessment applications

PIGLOW

EBENE

3.2- Longitudinal study on the use of PIGLOW and EBENE apps for welfare self-assessment

PPILOW

WP4: limit damages to pig and poultry physical integrity

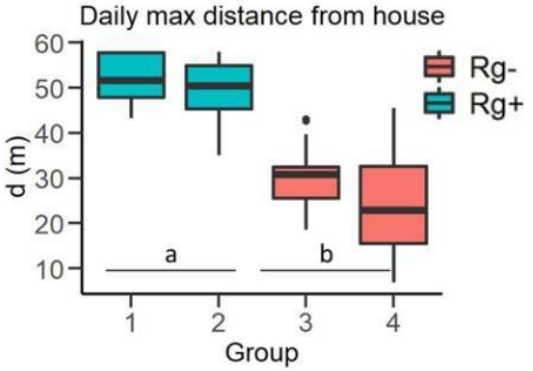
PPILOW WP4 by UU

- **Feather pecking: linked to fearfulness and lack of foraging opportunities**

→ **Use of green light during incubation or insect larvae as enrichment to reduce feather pecking in non beak-trimmed hens**

→ **Optimizing the design of the outdoor area to minimize feather pecking and canibalism in laying hens: larvae placed in outdoor pen to stimulate foraging behaviour**

→ Influenza confinement measures to limit feather pecking: installing a veranda, important to have enough stimulation inside, dual purpose flocks



✓ *Light during incubation and insect feeding at early age resulted in chicks that were less fearful of objects and humans at a later age.*

✓ *No major differences in feather pecking and feather damage were found*

✓ *Very small test groups can influence results: need to test in commercial flocks*

WP4: limit damages to pig and poultry physical integrity

- **Strategies to prevent undesired behaviour in entire male pigs and to avoid boar-taint in the end product**

→ **Duroc vs. Piétrain in organic circumstances**

→ **Health and welfare: few problems but slightly more scratches in Duroc**

→ **Duroc had lower carcass lean meat content with higher intramuscular fat content**

→ **The D pigs had a higher concentration of backfat androstenone (P < 0.01), but not of skatole**

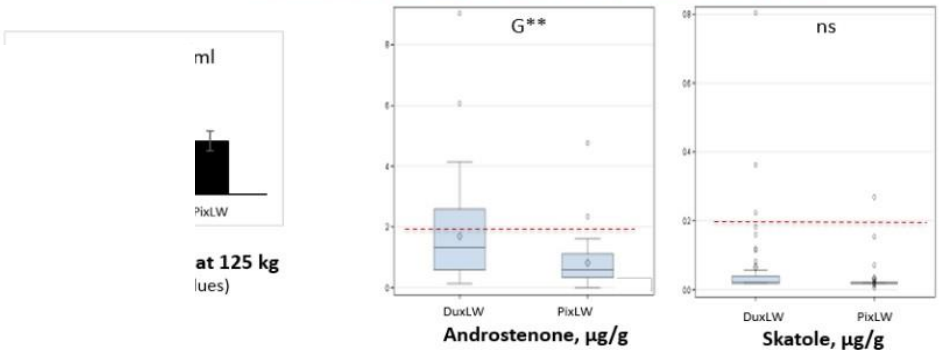
✓ *Duroc crossbreed appears to be favorable to welfare and quality of the meat, provided that the risk of undesirable odours is limited through management practices.*

Growth performance and carcass traits

	Duroc x LW	Pietrain x LW	Significance
Number of pigs	47	34	
Final live weight, kg	124.2	125.4	
Average growth rate (27-125kg), g/d	952	966	
Carcass weight, kg	96.5	98.4	G*
Lean meat content, %	58.9	60.8	G***

(mixed model, fixed effects of genotype: **G** and replicate: **R**; ***: P<0.001, *: P<0.05)

Trial 1: INRAE **Hormones and boar taint components in backfat**



Permutation tests

PPILOW Organisation

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- Limit damages to pig and poultry physical integrity
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SET-UP OF ON-FARM TRIALS

Tool selection

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Led by ACTA (ITAB)

ITAB,
SYSAAF
INRAE
AU
Thuenen
CNRS

PPILOW Alternatives for eliminating layer male chicks

Laws for stopping the elimination of layer male chicks in Germany in 2022 and France, Belgium in 2023

- **Objective : Evaluate the characteristics of the most promising dual-purpose breeds with regard to using information obtained on performance, nutrition, behaviour, and some welfare measures**

Genotype A: Broiler type

Genotype B: rustic breed (low selection)

Genotype C : Layer type

→ **Lower protein need and higher foraging**

→ **Health and welfare: Genotype C very good results**

→ **Very active birds (less resting, more foraging)**

→ **Genotype A good quality eggs, could serve for egg production (study AU 2021)**

→ **Some farmers from NPG are implementing the innovation**

5.2 in farms

Germany farm 1
- already has dual-purpose chicken
- small farm
- markets to catering

→ C males

Denmark
- C and A females

France farm 1
- big farm
- professional marketing
- first try with dual-purpose genotype

→ C males and females

Farm 2: C females

Open Access Article

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

by Marianne Hammershøj [1,*], Gitte Hald Kristiansen [1] and Sanna Steenfeldt [2]

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Foods **2021**, *10*(4), 897; **https://doi.org/10.3390/foods10040897**

PPILOW Alternatives for eliminating layer male chicks

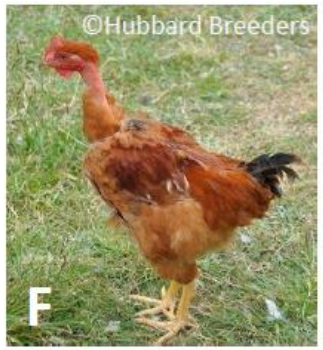
Laws for stopping the elimination of layer male chicks in Germany in 2022 and France, Belgium in 2023

- **Objective : Evaluate the characteristics of the most promising dual-purpose breeds with regard to using information obtained on performance, nutrition, behaviour, and some welfare measures**

→ **NPG selected genotype C**
to be tested on farm (FR and DE)
→ **Similar FCR & carcass weights in**
→ **both countries**

	France		Germany	
	C	F	C	D
Mortality, %	4.5	1.4	11	1.2
FCR (13 wk)	3.7	2.6	3.7	2.7
Carcass weights at 13 wk, kg	1.4*	2.0*		2.4
Carcass weights at 15 wk, kg	1.7*	2.4*		
Carcass weights at 16 wk, kg			1.8	

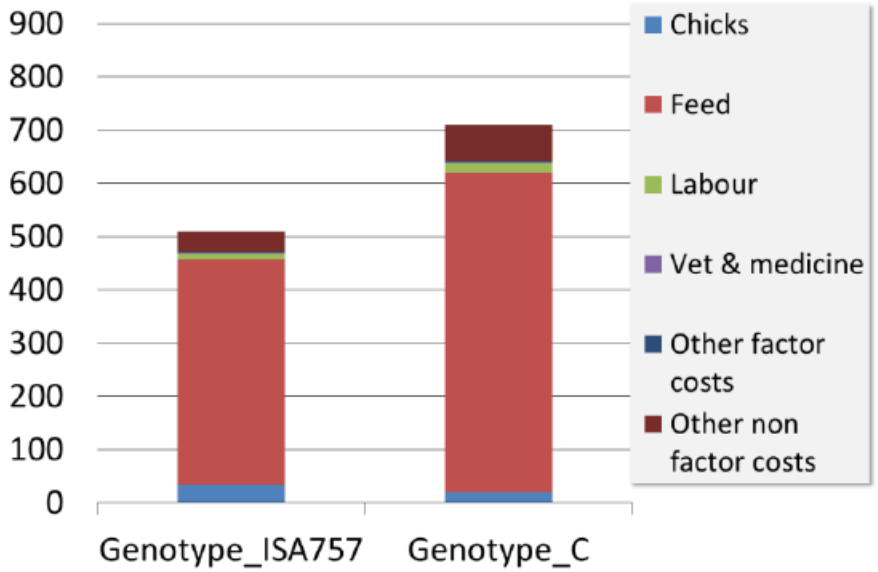
* Including neck

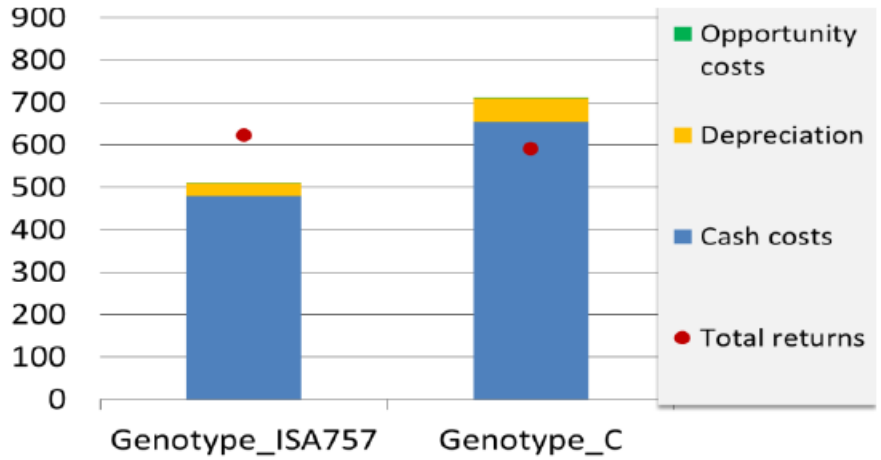


FR: Control genotype (S757N)

DE: Control genotype (JA757)

- conomic model - Data Analysis and Practice change analysis





→ **Genotype C has higher production costs due to higher feed costs (40 % higher FCR and 60 % lower daily weight gain): rearing is unprofitable**

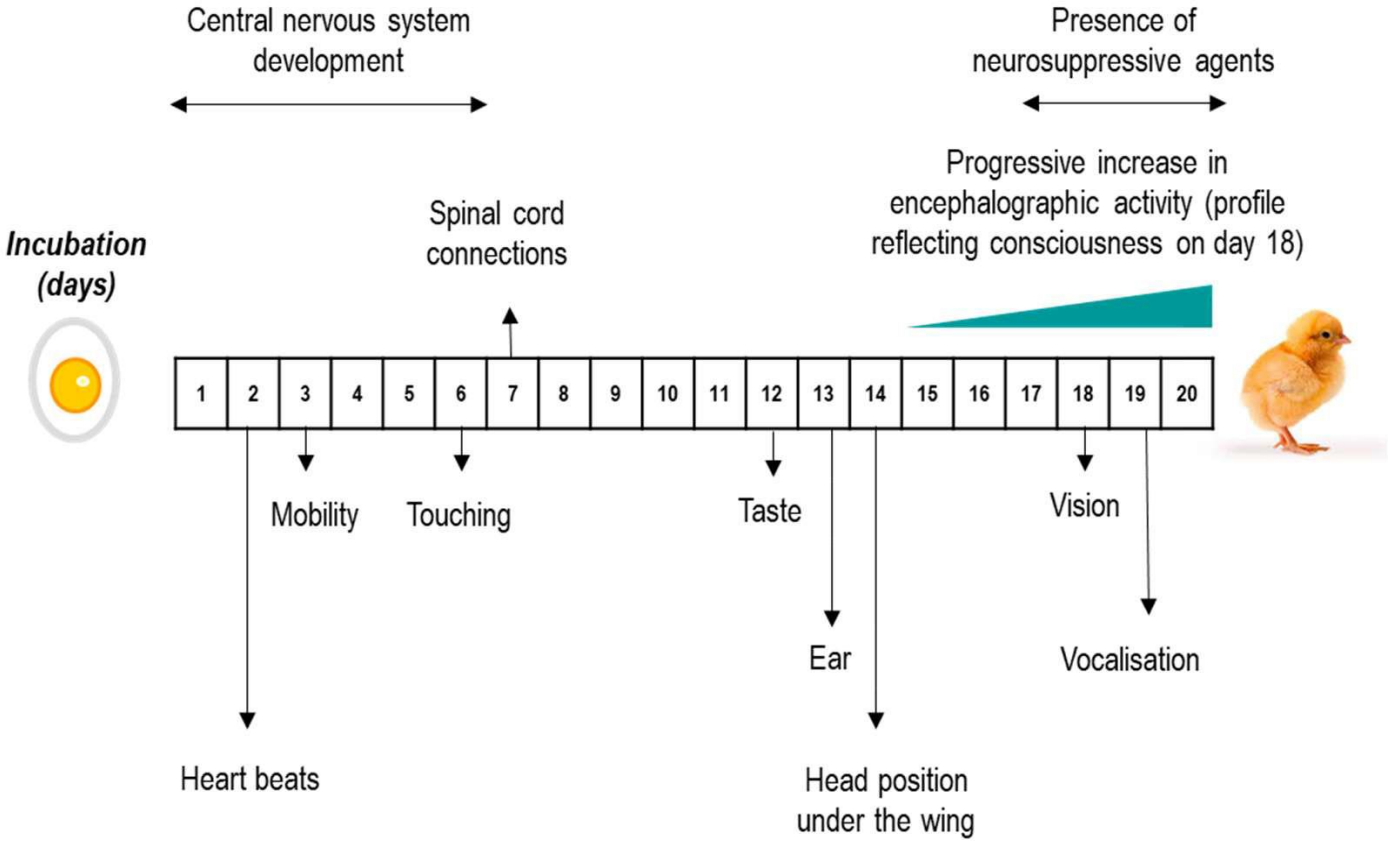
→ *Perspectives:*

✓ *Productivity of the females should be considered for a complete economic analysis of dual-purpose genotype: the costs can be "cross-subsidised" via a price premium for eggs*

✓ *Could males from dual-purpose genotypes valorize side products of the food industry to decrease feeding cost?*

Laws for stopping the elimination of layer male chicks in Germany in 2022 and France, Belgium in 2023

- **Objective 1: Identify early markers of male and female embryos in egg contents and extra-embryonic membranes (in ovo sexing)**
- **Objective 2: To develop a new radio-frequency based method for on-ovo sexing**

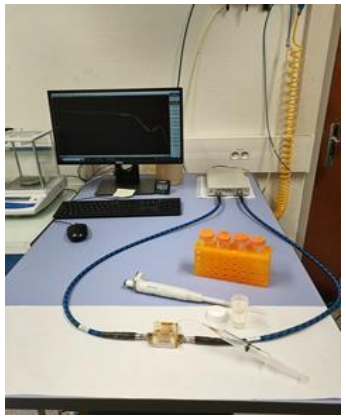


→ **Controversy depending on the parameter that is used**

→ **Absence of consciousness until day 15 of incubation**

→ **Grey zone between 8 and 13 days**

→ ***Radio-frequency non-invasive and low-cost***



PPILOW Improve robustness, health and exploration behaviours

- **Objective 1: Strategies for improving outdoor exploration by enrichment and identification and selection of valuable genotypes of slow-growing broilers with expected relevant traits suitable for outdoor systems**

→ behaviour affects product quality: foraging, immunity and thermoregulation

→ Strain-dependent n-3 fatty acid and antioxidant intakes, and nutrient storage efficiency

→ oxidative stress is important for the quality of the meat

- animal can have explorative behaviour but not better meat.
- oxidative energy is determined by feed (antioxidants), stress,...

✓ trade-off between meat performance and range-use but better health, lower oxidation

- **Objective 2: Incubation conditions and early life management for improving resilience in slow-growing chickens**

→ Cyclic embryonic thermal manipulation does not deteriorate hatchability but slightly affects chick quality at hatch in slow-growing chickens

→ Effect on thermoregulation, behaviour and resilience under investigation

Contents lists available at ScienceDirect
Applied Animal Behaviour Science
journal homepage: www.elsevier.com/locate/applanim
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Behavioural indicators of range use in four broiler strains

Claire Bonnefous[a,*], Ludovic Calandreau[b], Elisabeth Le Bihan-Duval[a], Vitor Hugo Bessa Ferreira[b,f], Alexandre Barbin[a], Anne Collin[a], Maxime Reverchon[c], Karine Germain[d], Laure Ravon[d], Nina Kruger[a], Sandrine Mignon-Grasteau[a,1], Vanessa Guesdon[c,1]

PLOS ONE

RESEARCH ARTICLE

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

Simona Mattioli[1]*, Alice Cartoni Mancinelli[1], Alessandro Dal Bosco[1], Claudia Ciarelli[2], Monica Guarino Amato[3], Elisa Angelucci[1], Diletta Chiattelli[1], Cesare Castellini[1]

frontiers in Veterinary Science
ORIGINAL RESEARCH

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, Arthur Simoni, Karine Germain, Christine Leterrier, Léa Lansade, Anne Collin, Sandrine Mignon-Grasteau, Elisabeth Le Bihan-Duval, Elodie Guettier, Hélène Leruste, Hanne Lavilie, Ludovic Calandreau and Vanessa Guesdon

scientific reports

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

Vitor Hugo Bessa Ferreira, Arthur Simoni, Karine Germain, Christine Leterrier, Léa Lansade, Anne Collin, Sandrine Mignon-Grasteau, Elisabeth Le Bihan-Duval, Elodie Guettier, Hélène Leruste, Ludovic Calandreau & Vanessa Guesdon

PPILOW Improve robustness, health and exploration behaviours

- **Objective 3: Improving the robustness of laying hens and piglets against parasitic and bacterial infections by innovative feeding strategies and optimal use of outdoor area rich in vegetation**

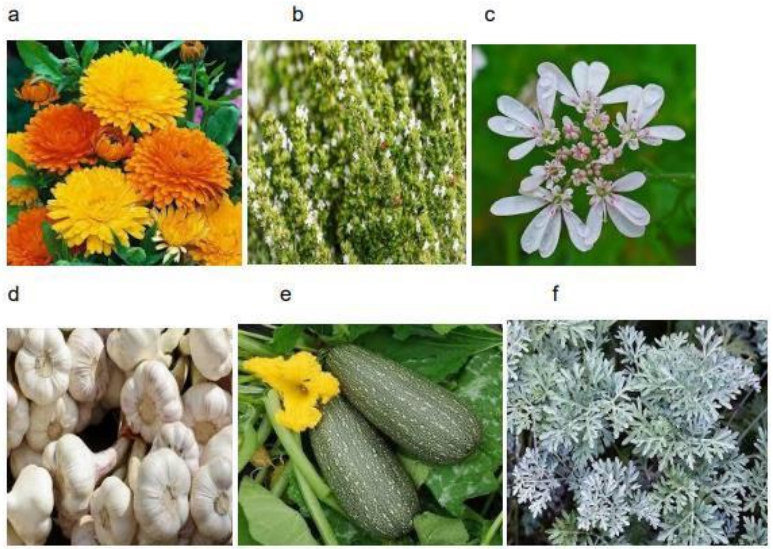


Figure 3: Plants with antiparasitic potential: *a-Calendula officinalis*, b- *Satureja hortensis L*, c- *Coriandrum sativum*, d- *Alium sativum*, e- *Cucurbita pepo*, *f-Artemisia absinthium*.

pathogens MDPI

Article

The Effects of *Allium sativum* L., *Artemisia absinthium* L., *Cucurbita pepo* L., *Coriandrum sativum* L., *Satureja hortensis* L. and *Calendula officinalis* L. on the Embryogenesis of *Ascaris suum* Eggs during an In Vitro Experimental Study

Mihai-Horia Băieş [1], Călin Gherman [1], Zsolt Boros [1], Diana Olah [2], Ana-Maria Vlase [3], Anamaria Cozma-Petruţ [4,*], Adriana Györke [1], Doina Miere [4], Laurian Vlase [5], Gianina Crişan [3], Marina Spînu [2] and Vasile Cozma [1,6]

Article

The Effects of *Allium sativum* L., *Artemisia absinthium* L., *Cucurbita pepo* L., *Coriandrum sativum* L., *Satureja hortensis* L. and *Calendula officinalis* L. on the Embryogenesis of *Ascaris suum* Eggs during an In Vitro Experimental Study

Mihai-Horia Băieş [1], Călin Gherman [1], Zsolt Boros [1], Diana Olah [2], Ana-Maria Vlase [3],

→ **Application in farms of NPG based on the in vitro tests carried out to evaluate the anti-parasitic, antibacterial and immune modulating effects of traditionally most used and readily available plants**

→ **The selected plants were powdered and added to the regular feeds of pigs adjusted to the age category and in a dosage depending on the plant species**

In Vitro

- ✓ **A. sativum, A. absinthium, C. pepo and S. hortensis extracts showed the strongest anthelmintic activity.**
- ✓ **Naturally reducing the load of potentially pathogenic, antibiotic resistant bacteria, as an alternative to classical antibiotic therapy.**
- ✓ **Alcoholic extracts can be used as disinfectant in livestock shelters**

In vivo

- ✓ **No side effects on appetite or health**
- ✓ **The powdered plants diminished the antimicrobial resistant bacterial load and improved the immune profile**

PPILOW Improve robustness, health and exploration behaviours

Fig. 1 and 2 – Farrowing huts from the Danish PPILOW partner firm Vanggård Staldmontage (© Vanggård)

- **Objective 4: Improve sow welfare and piglet survival through selective breeding and innovation within farrowing house design for outdoor rearing**

→ **Genetic lines for sow welfare and piglet survival**
→ **Crushing can probably be reduced by:**
→ **Breeding for more robust piglets, e.g. by using less productive breeds (Danbred vs Topigs Norsvin)**
→ **New farrowing hut design for sow welfare and piglet survival on the free range**
→ **Inputs from stakeholders : 2 farms in Italy, 2 farms in France, 1 in Belgium**

✓ **Heated creep area for piglets**
✓ **Support for sow to lay down with more care**
✓ **Welfare benefits of outdoor rearing: more nest building, outdoor foraging and general activity**

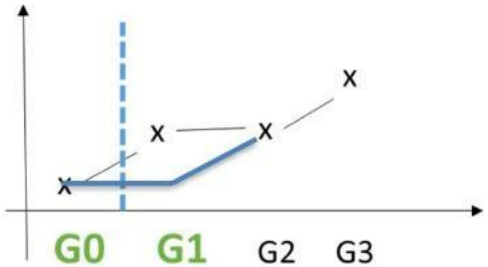
Fig. 1 and 2 – Farrowing huts from the Danish PPILOW partner firm Vanggård Staldmontage (© Vanggård)

Task 6.4
Improve sow welfare and piglet survival through selective breeding and innovation within farrowing house design for outdoor rearing
INRAE, AU, Vanggaard

- Genetic lines for sow welfare and piglet survival
- New farrowing hut design for sow welfare and piglet survival on the free range

Improve sow welfare and piglet survival through selective breeding

Response to selection



- Management of the population
- Sow maternal behaviour
- Sow stress at farrowing
- Human animal relationships
- Piglet social interactions

- On-farm trial in DK: pens with heated creep area tested
- Inputs from stakeholders : 2 farms in Italy and 2 farms in France with WP2

EU DESIGN - TEST HUTS: FRANCE ITALY BELGIUM

Assembling / setting up test huts Belgium - Adjusted design during the project test period

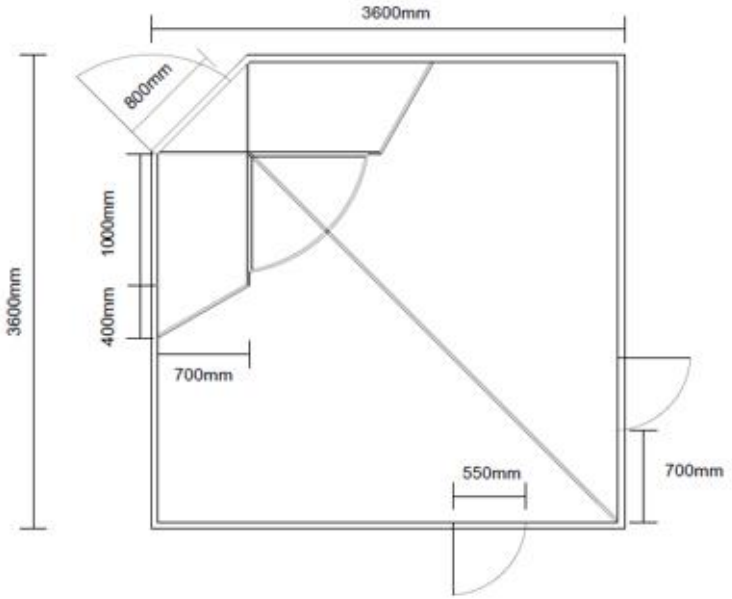
Steel hoops with a support function for the sow when she lies down

steel hoops => to minimizes straw in feed/water troughs

wider roof overhang above the ventilation opening

Transport wheels placed under the hut

wider doorway - sow entrance



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UNIVERSITY

LENE JUUL PEDERSEN
PROFESSOR, SECTION MANAGER

BioForum
SECTORORGANISATIE BIOLANDBOUW EN -VOEDING

PPILOW

PPILOW **PARTNERS**

Thanks for your attention!

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