



# PPILOW

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



PPILOW, a European project dedicated to Welfare in Poultry and Pig Low-input outdoor and Organic production systems (2019-2024)

## Newsletter - Issue 8

December 2023



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### Editorial - by Anne Collin (INRAE)

Welcome back into the PPILOW project! For this Autumn newsletter, you will get insights into the last outcomes of the project: our last annual meeting in Perugia hosted by the Department of Agriculture of the Perugia University, that was followed by the PPILOW project Autumn School in Assisi presenting the very last results of the project to students, farmers and many other poultry or pig practitioners and the session dedicated to PPILOW topic at the last EAAP scientific meeting in Lyon. You will find here a short focus on our latest results published in 2023. Meet our new PPILOW people and know where and when to know more about our results or contact us at further national or international events!

### PPILOW 4<sup>th</sup> Annual Meeting in Perugia! - by Anne Collin (INRAE)

The PPILOW 2023 annual meeting was held in Perugia in Italy on the 23<sup>rd</sup> and 24<sup>th</sup> of October. It was a great opportunity to exchange on the various results of each involved team and to consolidate the necessary interactions between partners investigating on the levers of Welfare improvements for poultry and pigs in low input outdoor and organic systems, especially in view of the building of the associated multicriteria analyses and business models. After scientific exchanges around posters, we particularly focussed on the feedbacks of farmers and technicians on the use of the PIGLOW app for welfare-self-assessment in small-scale pig farms, on

the feedbacks of different stakeholders on the criteria to be used for multicriteria analyses of PPILOW innovations. The partners also shared a focus on the PPILOW innovations currently implemented on-farm with partners facilitating the National practitioner Groups, and the project final roadmap for the dissemination of PPILOW outputs during its last 9 months of EU funding.

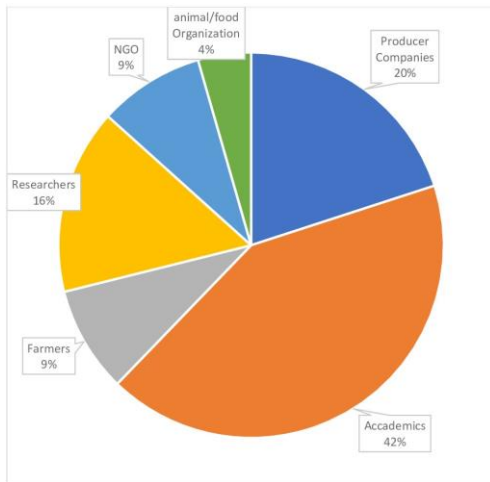


**Great success for the PPILOW autumn school! – by Marlène Sciarretta (EAAP), Cesare Catellini e Simona Mattioli (UNIPG)**



The PPILOW autumn school three-day event recently took place from 25th to 27th October in Assisi, Italy, organised by EAAP and University of Perugia. The primary aim of the event was to introduce researchers, veterinarians, technicians, farmers, university and post-doc students to the PPILOW project and give them an overview of the most recent results obtained, and the novel techniques being used inside the project. Forty-five participants from Italy, Spain, Romania, Belgium, Netherlands, Finland, UK, Switzerland and Ireland attended the event. They had different backgrounds and a keen interest in welfare and animal breeding. The event provided an excellent platform for the

participants to interact with each other and share their knowledge and experiences.



The training school was divided into two different sessions that focused on the various activities of the PPILOW project. The sessions were led by experts in the field who are directly involved in specific activities of the project. The topics included animal welfare and ethical issues, and the adaptability to outdoor rearing systems. At the end of each session, the participants animated practical team work sessions with the aim to analyse the viewpoint of the chain actors (Producers and breeders, Civil Society, Technical Experts, Supply chain, Academic/R & D experts) of poultry production, addressing topics as: the choice of poultry genotypes, housing system, management practices, diets, product quality, environmental impact, and action to overcome the main problems.

On the last day, the students visited the Azienda Agricola San Bartolomeo, located in Viterbo, a unique reality in central Italy, where for years they used a free-range poultry rearing, in a huge agroforestry system (about 300 ha of consociation of olive trees and poultry). Overall, the PPILOW autumn school was a success, and the participants found it an enriching and rewarding experience with a deeper understanding of the PPILOW project. There were many exchanges of experiences around the low-input outdoor and organic systems for pig and poultry, and discussions on how to improve their welfare. Moreover, the event provided attendees with a unique opportunity to interact with international experts in the field.



## PPILOW scientific publications

### **1: Detection of *Trichinella* spp. larvae in domestic pigs (*Sus scrofa domesticus*) and golden jackals (*Canis aureus*) using artificial digestion and a microfluidic device: a comparative study - by Vasile Cozma and Zsolt Boros (USAMV)**

Nematodes of genus *Trichinella* are zoonotic parasites and are among the most widespread parasites of swine, badgers, bears and predatory animals like wolves, foxes or jackals. This study aimed to compare the detection capacity (for *Trichinella* spp. larvae) of artificial digestion and an experimental microfluidic device. A total of 20 samples positive for *Trichinella* spp. in trichinosis (10 domestic pigs and 10 golden jackals) were tested (5 g/animal) with both artificial digestion method and a microfluidic device. Artificial digestion is the gold standard method for direct detection of *Trichinella* larvae in meat samples. A microfluidic device is a new approach regarding *Trichinella* spp. detection, and in this study, a newly designed experimental device was used (Bionics Biomicrofluidics lab, Budapest). All of the tested pig and golden jackal samples came out positive in the artificial digestion method, but also in the microfluidic device. The total number of counted larvae was significantly higher in artificial digestion (695 larvae in jackals; 486 larvae in pigs) than in the microfluidic device method (291 larvae in jackals; 263 larvae in pigs). When the experimental device was used, the larval structure was more visible than in the golden standard method. The results described here indicate that the microfluidic device can be used in the direct detection of *Trichinella* larvae in domestic and wild animals, allowing the visualization of their structure, but it's not as efficient as artificial digestion in counting the number of larvae.

**Detection of *Trichinella* spp. larvae in domestic pigs (*Sus scrofa domesticus*) and golden jackals (*Canis aureus*) using artificial digestion and a microfluidic device: a comparative study.** Zsolt Boros, András József Laki, Luciana Cătălina Panait, Călin Gherman, Vasile Cozma. *Sci Parasitol.*, 2023,24 (1-2): 9-15, ISSN 1582-1366.

### **2: Green light during incubation does not negatively affect hatching characteristics in brown and white laying hens - by Saskia Kliphuis (UU)**



Light transmission measurements - © UU

An exciting paper was published last summer regarding the effects of green LED light during incubation on hatching characteristics in brown and white laying hens. This study was conducted by colleagues from the ChickenStress European Training Network and the Utrecht University partners of the PPILOW project. Providing light during incubation is a promising method to improve welfare in later life in poultry, because it would more closely approximate chicken natural environment compared to the current incubation in darkness. So far, little is known about the effects, either positive or negative, of light during incubation on hatching characteristics. We investigated the effects of this incubation method (hatch time, hatchability, chick quality, body weight and embryonic age of death) in two different laying hen hybrids. Dekalb White (DW) and ISA Brown (ISA) eggs were incubated in complete darkness or in a light: dark cycle of 12L:12D throughout incubation. First, light

embryonic age of death) in two different laying hen hybrids. Dekalb White (DW) and ISA Brown (ISA) eggs were incubated in complete darkness or in a light: dark cycle of 12L:12D throughout incubation. First, light

transmission through the eggshell was measured through 27 eggs. Then, the effects of light during incubation on hatching characteristics were investigated on 711 chicks. Light during incubation had no effects on hatching characteristics. Even though light transmission was higher through white eggshells than through brown eggshells, this did not cause any differences in hatching characteristics. There were some differences between brown and white hybrids, regardless of the light treatment: hatch time was longer and navel quality was better in DW than in ISA, while body weight and embryonic age of death were lower in DW than in ISA. To conclude, green light during incubation did not negatively affect hatching characteristics in either DW nor ISA laying hen hybrids. Future research should therefore focus on its potential benefits for laying hen welfare.



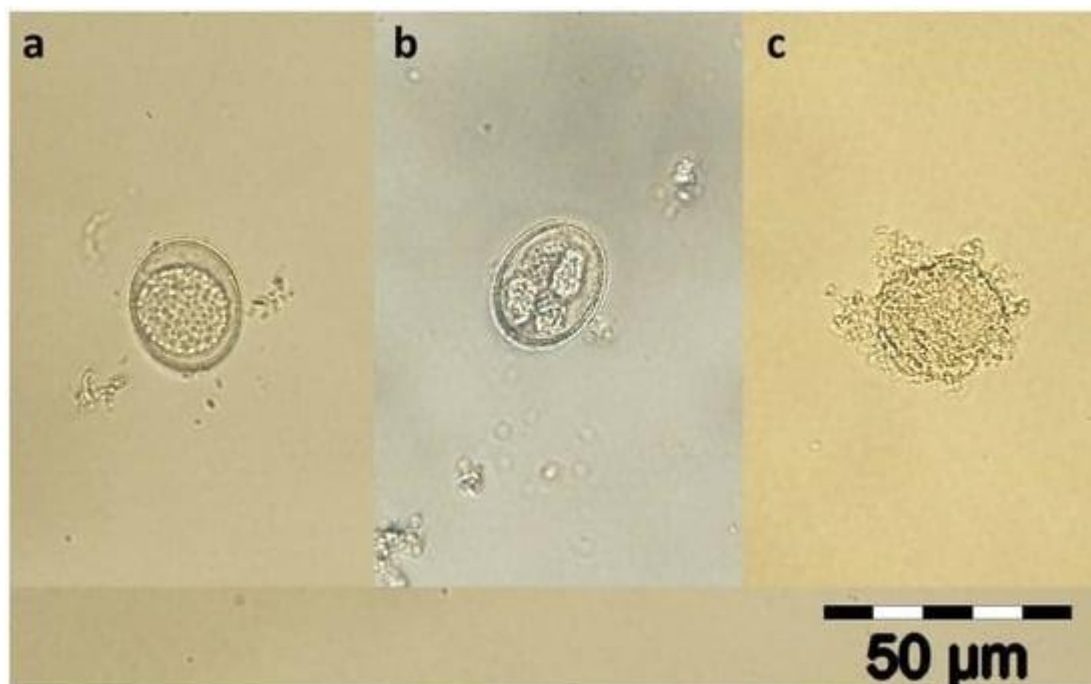
Hatching chicks - © UU

**Green light during incubation: effects on hatching characteristics in brown and white laying hens.** Manet, M. W., Kliphuis, S., van den Brand, H., Nordquist, R. E., Goerlich, V. C., & Rodenburg, T. B. (2023). *Livestock Science*, 105270. <https://doi.org/10.1016/j.livsci.2023.105270>

**3: 1) *The Effects of Coriandrum sativum L. and Cucurbita pepo L. against Gastrointestinal Parasites in Swine: an In Vivo Study*; 2) *The In Vitro Anticoccidial Activity of Some Herbal Extracts against Eimeria spp. Oocysts Isolated from Piglets - Vasile Cozma and Marina Spinu (USAMV)***

Swine, as other domestic farmed species are prone to parasitic diseases, which cause major damage to their welfare and health in conjunction with a substantial economic impact on the farmer. In low input systems, the traditional use of medicinal or aromatic plants helped the prevention but also cure of parasitic diseases, in some instances along with the impairment of pathogenic bacteria growth and enhancement of immune response against aggressors. Nevertheless, the scientific substantiation of such uses of medicinal plants are scarce in some cases. Therefore, in this study, the antiparasitic potential of *Cucurbita pepo* L. and *Coriandrum sativum* L. against protozoa and nematodes found in swine was tested. The main age and production categories of pigs (weaners, fatteners and sows) were targeted, from which feces/rectal swabs were collected. The samples were subjected to flotation (Willis and McMaster), active sedimentation, Ziehl-Neelsen stain modified by Henricksen, modified Blagg and eggs/oocysts culture techniques. The identified parasite panel included, depending on age category, *Ascaris suum*, *Trichuris suis*, *Oesophagostomum* spp., *Balantioides coli* (syn. *Balantidium coli*), *Eimeria* spp. and *Cryptosporidium* spp. The effects observed after the administration for ten consecutive days of 500 mg/kg bw/day of powdered *C. pepo* and of 170 mg/kg bw/day of powdered *C. sativum* were pronounced anthelmintic for the pumpkin and antiprotozoal for the coriander against the

abovementioned parasites. Such results, meanwhile representing data within the first Romanian report on the *in vivo* antiparasitic activity of both plants, provide small farmers that keep their animals in low-input and free-range systems with potential natural, highly bioavailable and economic resources to control the health of their herds. As in traditional medicine, aromatic plants were often used to combat coccidia, this study aimed at investigating the *in vitro* anticoccidial effects of *Allium sativum* L. (garlic), *Artemisia absinthium* L. (wormwood), *Coriandrum sativum* L. (coriander), *Cucurbita pepo* L. (pumpkin), *Satureja hortensis* L. (summer savory), and *Calendula officinalis* L. (marigold) against *Eimeria suis* and *Eimeria deblickei* oocysts. For that a stock solution of oocysts (58% *E. suis* + 42% *E. deblickei*) was used after three days of incubation, without any supplementation. The unsporulated *Eimeria* spp. oocysts were co-incubated in a 3 mL well plate for 96 h at 27 °C with serial dilutions of alcoholic plant extracts (5%, 2.5%, 1.25%, 0.625%, and 0.312%). To monitor the effects of the extracts' concentrations on the oocysts, their sporulation and destruction percentage was recorded every 24 h, for four days. The sporulation of the oocysts was significantly ( $p = 0.05$ ) inhibited (3.6% sporulated oocysts) by the 5% marigold extract, which also had the highest destructive effect (65.2% destroyed oocysts). Although all plants were effective when compared to control cultures, the results indicated the marigold extract as the most valuable, followed by the wormwood, coriander, garlic, pumpkin, and summer savory extracts. This investigation could represent a first step in the obtainment of a range of natural disinfectants active against *Eimeria* oocysts as contaminants of swine.



**Figure 1.** Unsporulated (a), sporulated (b), and destroyed oocyst of *Eimeria suis* (400×). The concentration of 50 mg/mL of each APE produces complete oocyst wall destruction (c).



**The Effects of *Coriandrum sativum* L. and *Cucurbita pepo* L. against Gastrointestinal Parasites in Swine: An *In Vivo* Study.** Băieș, M.-H.; Cotuțiu, V.-D.; Spînu, M.; Mathe, A.; Cozma-Petruț, A.; Miere, D.; Bolboacă, S.D.; Cozma, V., *Microorganisms* 2023, 11, 1230. <https://doi.org/10.3390/microorganisms11051230>


**The *In Vitro* Anticoccidial Activity of Some Herbal Extracts against *Eimeria* spp. Oocysts Isolated from Piglets:** Baies, M.-H.; Györke, A.; Cotutiu, V.-D.; Boros, Z.; Cozma-Petruț, A.; Filip, L.; Vlase, L.; Vlase, A.-M.; Crisan, G.; Spînu, M.; Cozma V., *Pathogens* 2023, 12, 258. <https://doi.org/10.3390/pathogens12020258>



#### 4: Behavioural indicators of range use in four broiler strains - by Claire Bonnefous (INRAE)

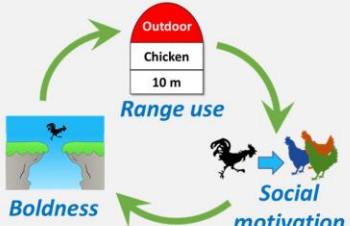
A specificity of organic chicken meat production is the mandatory outdoor access where animals can express their natural behaviours, such as foraging or exploring. However, range use is highly variable among animals of the same flock. Hence there is a need to better understand the individual factors and potential predictors related to range use. On the one hand, our results confirm that range use is a personality trait in all four studied strains as it differs between individuals but shows within-individual consistency over time. On the other hand, social motivation and boldness seem to be personality traits only in certain strains. Conducting both individual behavioural tests and direct observations before range access, we observed differences in early behaviours by strains and very few significant correlations with range use. While the foraging behaviour positively correlated (significantly or only a tendency) in three strains, no early behaviour correlated with range use in all four studied strains. Therefore, early behaviour did not predict range use in our conditions, but the foraging behaviour calls for further investigation.

### Behavioural indicators of broilers' range use in four genetic strains









**4 strains**  
Observed indoors and outdoors  
From  to 





**Boldness** → **Range use** → **Social motivation**

- 

**Early behaviours depend on strain**
- 

**Range use is time-consistent**  
↳ It could be a personality trait
- 

**Early behaviour does not predict range use**
- 

**Foraging associated to range use**  
↳ Calls for further investigation
- 

**Boldness, social motivation = personality traits but depend on strain**

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**Behavioural indicators of range use in four broiler strains.** Bonnefous, C., Calandreau, L., Le Bihan-Duval, E., Ferreira, V.H.B, Barbin, A., Collin, A., Reverchon, M., Germain, K., Ravon, L., Kruger, N., Mignon-Grasteau, S., & Guesdon, V. (2023). *Applied Animal Behaviour Science*, 260(105870). <https://doi.org/10.1016/j.applanim.2023.105870>



## New people in the PPILOW project: Liên Romeyns



**Liên Romeyns (BioForum, project officer for agriculture)**





Liên studied Geomorphology at the University of Ghent in Belgium, where she focused on erosion on different land uses in the Ethiopian mountains. Traveling after her studies took her around the world, joining permaculture projects in different places and learning about sustainable land use where she could. Back in Belgium she joined a social project for raising awareness around food waste and worked in the organic and agro-ecological sector for 4 years before starting at Bioforum in September 2023, thus joining the PPILOW consortium. At Bioforum she is supporting the Flemish pig and poultry organic farmers with change making facilitation. In PPILOW she is engaged in the facilitation of the Flemish Practitioner Groups.

## PPILOW partners presented the latest results at EAAP meeting in Lyon, France! - by Anne Collin

The European Federation of Animal Science (the PPILOW partner EAAP) organized in late August and early September in Lyon (France) its annual meeting with a particular session (#62) dedicated to PPILOW topic "Poultry and pig Low-input and organic production system's welfare". This session was co-chaired by The Pig/Poultry Commission (Gürbüz Daş) and the Health and Welfare Commission (Mirjam Holinger) with a co-chair by the PPILOW coordination (Anne Collin). After a Keynote lecture presented by INRAE on the barriers to welfare and levers for improvement in organic and low-input outdoor pig and poultry farms, six communications from PPILOW partners were mixed with communications from external scientists for favouring knowledge exchange on the target topic. In particular, PPILOW partners presented the project outputs on range use by broilers (INRAE), on the use of dual-purpose breeds for avoiding the culling of layer male chicks on the technical (Thuenen Institute and ITAB) and economic (LUKE and Thuenen Institute) points of view, on intact male pigs welfare in organic farming and the associated pork quality (INRAE), on breeding for piglet survival (INRAE), and finally on animal welfare assessments comparing scientists and free-range pig farmers assessments with the PIGLOW app (ILVO). These communications can be accessed [on the PPILOW website](#).

## Coming and past events

List of the upcoming and past events with PPILOW project partners attendance.

Event 	Date 	Location 	Partners 
<a href="#">Webinar on on-farm hatching 'L'Éclosion à la Ferme : des résultats et des cas concrets'</a> (in French)	30 November 2023	Online	ACTA(ITAVI), INRAE

<a href="#">56èmes Journées de la Recherche Porcine</a> (56 <sup>th</sup> Swine Days' Research) in French with English translation	6 -7 February 2024	Saint-Malo, France	INRAE, IFIP, ITAB
Webinar on non-castrated male pigs in collaboration with project Farinelli (in French)	11 March 2024	Online	INRAE, ITAB, IFIP
<a href="#">15èmes Journées de la Recherche Avicole et Palmipèdes à Foie Gras</a> (15 <sup>th</sup> Avian Days' Research)	20 – 21 March 2024	Tours, France	INRAE, ITAVI, ITAB, JUNIA, UNIPG, ILVO, Thuenen Institute, Aarhus University
<a href="#">The 10<sup>th</sup> International Mediterranean Symposium on Medicinal and Aromatic Plants</a>	25– 27 April 2024	Istanbul, Turkey	USAMV



*Credit Armelle Prunier © INRAE*

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