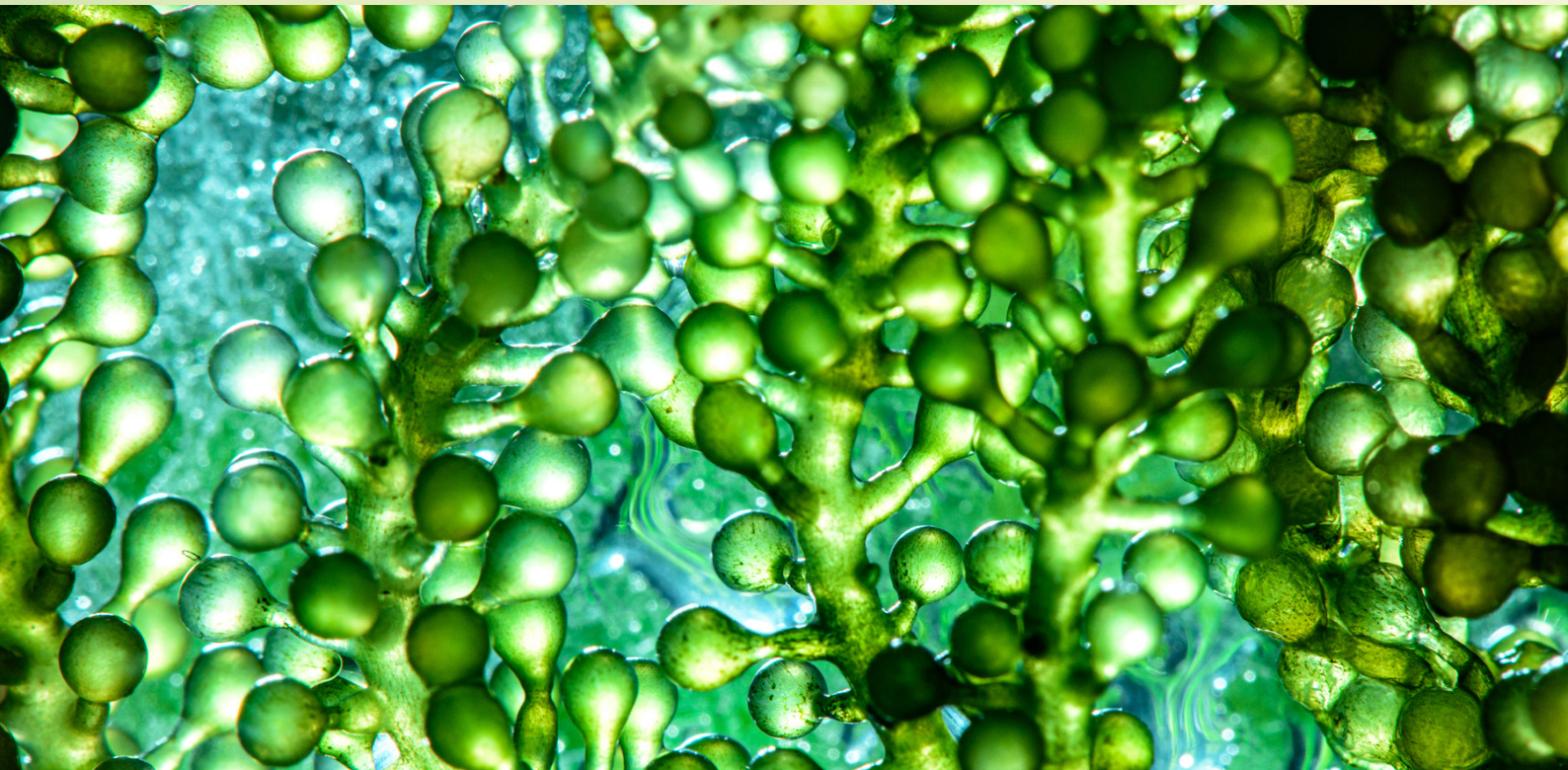




## CIPROMED

Circular and Inclusive utilisation of alternative  
PROteins in the MEDiterranean value chains



CIPROMED is making excellent progress.

The consortium has successfully achieved several key milestones and has demonstrated remarkable activity through its participation in various networking and knowledge-sharing events.

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# Agri-industrial side-streams and byproducts identification and collection

CIPROMED partners aim to valorise agri-industrial side-streams and byproducts for the rearing of the yellow mealworm [YM], *Tenebrio molitor*, and the black soldier fly [BSF], *Hermetia illucens*. Several byproducts have been identified and collected so far, e.g., oilseed presscakes, brewer's spent grains, food processing residues and agricultural by-products. Initially, the nutritional composition of the side-streams is determined, and subsequently compound diets are designed and formulated based on the nutritional value of the side-streams and the nutrient requirements of the insects. Feeding trials, both at laboratory- and pilot-scale, are currently being conducted to determine the growth performance of YM and BSF larvae in these diets and identify the most suitable ones for their rearing.



*Oilseed presscakes and other food processing residues and agricultural byproducts evaluated within CIPROMED as insect diet ingredients.*

## Legumes cultivation with insect frass as soil fertilizer

Frass from YM and BSF larvae are fully analysed for their content in macronutrients and micronutrients. Currently, several pot and field trials with frass as soil biofertilisers are conducted in Greece and Morocco for lupins and faba beans, respectively.



*Pot trial in University of Thessaly [UTH] for the evaluation of yellow mealworm frass as biofertilizer for lupins.*



*Field trials in Greece [Chalkidiki, Larissa] for the evaluation of yellow mealworm frass as biofertilizer for lupins.*



*Scientific visit of CIPROMED coordinator Professor Athanassiou Christos and Professor El Yaacoubi Adnane in the field trials in Morocco [Ain Taoujdate] for the evaluation of black soldier fly frass as biofertilizer for faba beans.*

## Cultivation of *Chlorella* sp.

**Chlorella sp. cultivation and scale-up process has been established at laboratory, pilot, and industrial scale. The cultivation medium and growth parameters have been established for each step of the scale-up process. This microalgal species has been cultivated in different outdoor cultivation technologies including bubble columns, vertical tubular PBRs and vertical flat panels. Additionally, to optimise the protein content of the harvested biomass, a comparison of different nitrogen sources will be performed. The nitrogen sources and the concentrations have been established and the experimental design has been defined.**

Chlorella sp. cultivation and scale-up process in AlgaEnergy laboratory.



# Cultivation of *Galdieria sulphuraria*

A 200 L bioreactor and a 100 L hydrolysis reactor have been set up to cultivate *Galdieria sulphuraria* and to provide necessary biomass for subsequently experiments to be carried out in Cipromed. For the cultivation spent brewer's grains will be hydrolysed and used as source for amino acids. Currently 100 kg has been collected which will eventually be hydrolysed. Additionally, 600 kg of molasses has been collected which will be applied as carbon source. Based on the collected substrates, cultivation experiments have been carried out lab scale and the results will now be transferred to the pilot scale cultivation.



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## Meet the partners

The National Research Council (CNR) is the largest public research institution in Italy and it was founded in 1923. AS part of the CNR, the Department of Biology, Agriculture and Food Science (DBAFS) carries out research and promotes innovation in all fields related to agriculture and food science. CNR researchers from Institute of Sciences of Food Production (ISPA), a centre of excellence, worldwide renowned, acting in the fields of scientific research, innovation and technology transfer aimed at improving safety and quality of agro-food products, are involved in the CIPROMED project.



## Meet the Team



Dr. Francesco Gai  
CNR ISPA

Dr. Francesco Gai is a Senior researcher at CNR ISPA, expert in Animal Science and more specifically in animal nutrition and metabolism with a particular focus on the quality and food safety of derived products of animal origin.

### Why is the CIPROMED project important?

The CIPROMED project using a strong network of different expertise, covering different aspects of applied sciences, can contribute in a concrete manner to bring on the table of the consumers traditional and innovative foods with a minor environmental impact but at the same time safe for the consumer's.

### What will the CIPROMED project add to the current scientific state-of-the-art?

CIPROMED project aim to provide science-based evidence able to overcome the consumers perplexity on the use of innovative alternative based foods. The combined use of traditional and innovative (omics) scientific methodologies will ensure to provide original data that could provide answers to the call challenges in terms of food safety and consumer perception.

### What will be the role of your organization in the project?

The role of the CNR will be focused in the formulation of new animal feeds as well in the evaluation of the food safety of the food prototypes developed during the project. The food safety will be investigated in terms of protein allergenicity and cytotoxicity by means the use of proteomic techniques and cell culture systems of the appropriate cell type.

## Publications

**Two publications from CIPROMED partners were recently published:**

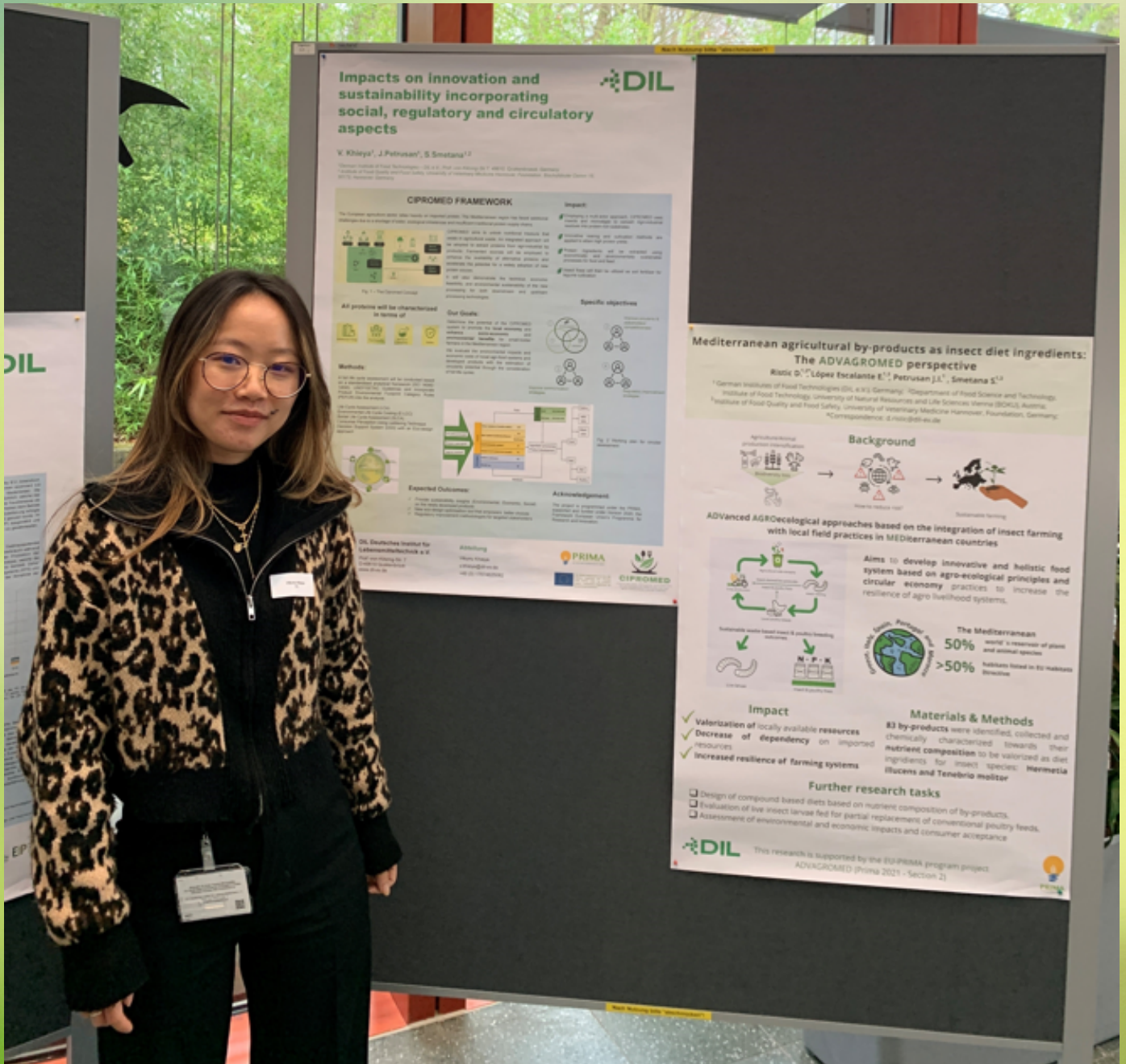
- 1 Athanassiou, C.G., Smetana, S., Pleissner, D., Tassoni, A., Gasco, L., Gai, F., Shpigelman, A., Bravo Cadena, M., Gastli, M., Conceição, L.E.C., Gronich, E., Paolacci, S., Chalkidis, V., Kuthy, M., Stolzenberger, R.E., El Yaacoubi, A., Mehlhose, C., Petrusán, J.-I., Rumbos, C.I., 2024. Circular and inclusive utilization of alternative proteins: A European and Mediterranean perspective. *Current Opinion in Green and Sustainable Chemistry* 46: 100892. [🔗](#)
- 2 Pleissner, D., Händel, N., 2023. Algae cultivation as measure for the sanitation of organic Waste—A Case study based on the alga *Galdieria sulphuraria* grown on food waste hydrolysate in a continuous flow culture. *Sustainability* 15: 14313. [🔗](#)





# Dissemination activities

**Stakeholder Conference: Circular Economy in the Agricultural and Food Industry:** February 19, 2024, Osnabrück, ZUK Center for Environmental Communication of the DBU (Deutsche Bundesstiftung Umwelt/German Federal Environmental Foundation)



*Vikunu Khieya from DIL, presenting the CIPROMED poster in the Stakeholder Conference - Circular Economy in the Agricultural and Food Industry*

## Dissemination activities

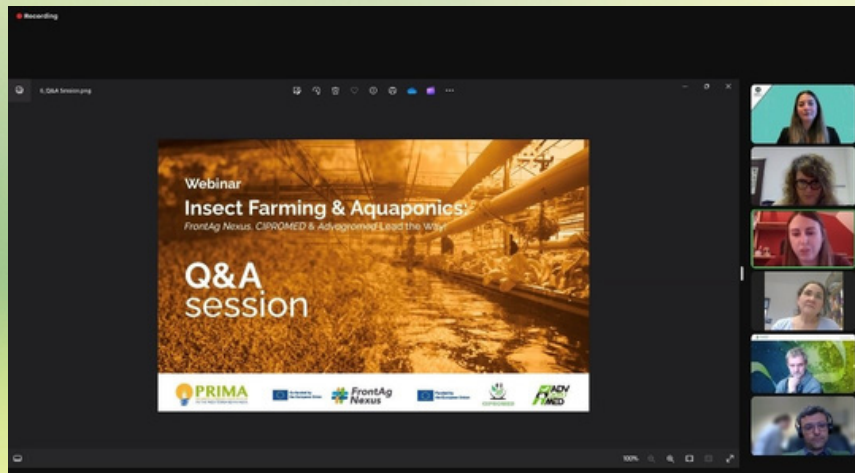
During the XII European Congress of Entomology [ECE2023] that was held in Heraklion, Crete between 16 and 20 October 2023, two CIPROMED partners, particularly University of Thessaly [UTH] and University of Turin [UNITO] jointly organized a workshop titled **“Insects on the plate - Edible insects for food and feed”**, in order to further promote CIPROMED and disseminate its concept, objectives and preliminary results. The workshop was jointly organized with another PRIMA project, ADVAGROMED. [🔗](#)




*CIPROMED workshop during ECE2023*

# Dissemination activities

CIPROMED participated in a webinar jointly organized with two other PRIMA projects, namely FrontAg and ADVAGROMED, titled **“Insect Farming and Aquaponics”**. The webinar was organized on the 27th February 2024 and was attended by more than 50 participants.



*Screenshot of the webinar “Insect Farming and Aquaponics”*

Watch the webinar here: 

Several CIPROMED partners participated in the field visit at the insect facility of the “Green Development and Innovation Association” [GDI], which was jointly organized with another PRIMA project “ADVAGROMED”.



*Scientific visit of CIPROMED partners at the insect facility of the “Green Development and Innovation Association”*

## Coming up..

The first CIPROMED results will be published in forthcoming conferences and congresses. Specifically, abstracts have been accepted for publication in the following congresses:



**INSECTA2024** , 14 - 16 May 2024, Potsdam, Germany -Stay tuned for the next CIPROMED workshop in INSECTA! [🔗](#)

**IFW24** - Insects to Feed the World, 19-22 June 2024, Singapore [🔗](#)

**75th EAAP Annual Meeting** - European Federation of Animal Science - 1-5 September 2024, Florence, Italy [🔗](#)



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PARTNERSHIP FOR RESEARCH AND INNOVATION  
IN THE MEDITERRANEAN AREA

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