



Demonstration of innovative functional food production systems based on more sustainable value chain of marine and freshwater raw materials, such as macro/microalgae and different animal species, for conscientious European consumers.

## HIGHLIGHTS AND KEY DEVELOPMENTS

### PILOT CASES OFFICIALLY LAUNCHED IN ITALY AND GREECE, A CONCRETE STEP TOWARD DIGITAL SEAFOOD TRACEABILITY

Entering its 24th month, the project officially launched the pilot cases for testing the new mobile app for seafood traceability.

Two leading aquaculture companies are at the forefront of this phase:

- **Aqua De Mã** - University of Genoa (Italy)
- **Kefalonia Fisheries** (Greece)

Both companies have begun integrating the **NOVAFOODIES app** into their supply chains. In select stores, seafood products will feature **QR codes** that consumers can scan using the free Android and iOS mobile app, instantly accessing key information about the product's origin, farming method, and journey from sea to plate.

The app, developed by [GO INFOTEAM](#) under the WP6 – *IT tools development and monitoring for traceability and enhanced trust*, led by [ITENE](#), is a practical example of how digital innovation—through technologies like IoT, Blockchain, RFID, and QR systems—can enhance transparency, promote sustainability, and build consumer trust in the seafood sector.



NOVAFOODIES app



RFID reader



QR code label

## INNOVATIVE ECO-PRODUCTION SYSTEMS

As part of the NOVAFOODIES project, a large-scale recirculating system for *Ulva* spp. cultivation has been completed and recently inoculated with seaweed (1) for eco-packaging production (3). Trials are advancing on *Cladophora* sp. growth using various waste streams, including swine wastewater and wastewater from the shipping industry, to optimize circular algae cultivation in an open-air pilot system at the Port of Limassol (4). Estuarine culture of *Ulva* in cages and *Codium* on ropes has been tested see how environmental conditions affect growth throughout the year. In addition, upscaling the conversion of beach wrack into gammarid biomass is in progress using newly-established stable marine gammarid cultures (*Gammarus oceanicus* and *G. locusta*) with constant propagation (2).

*Chlorella vulgaris* (CCAP 211/11B) and *Schizochytrium* sp. S31 (ATCC 20888), approved for human food from the European Food Safety Authority, are being cultivated for their essential amino acids and omega-3 lipids, respectively. Production optimization focuses on biomass, protein and lipid responses to environmental variables. Bench-scale trials are informing pilot-scale (100 L) protocols for novel food development enriched with whole biomass and/or protein-lipid extracts.



1: The completed large-scale recirculating aquaculture system for seaweed cultivation at TRL6-7. The construction was completed in March and inoculated with *Ulva* spp. from our shelving unit in April



2: *G. locusta* feeding on red algae *Ceramium*.



3: The seaweed eco-packaging prototype



4: Open-air algal pilot installation.

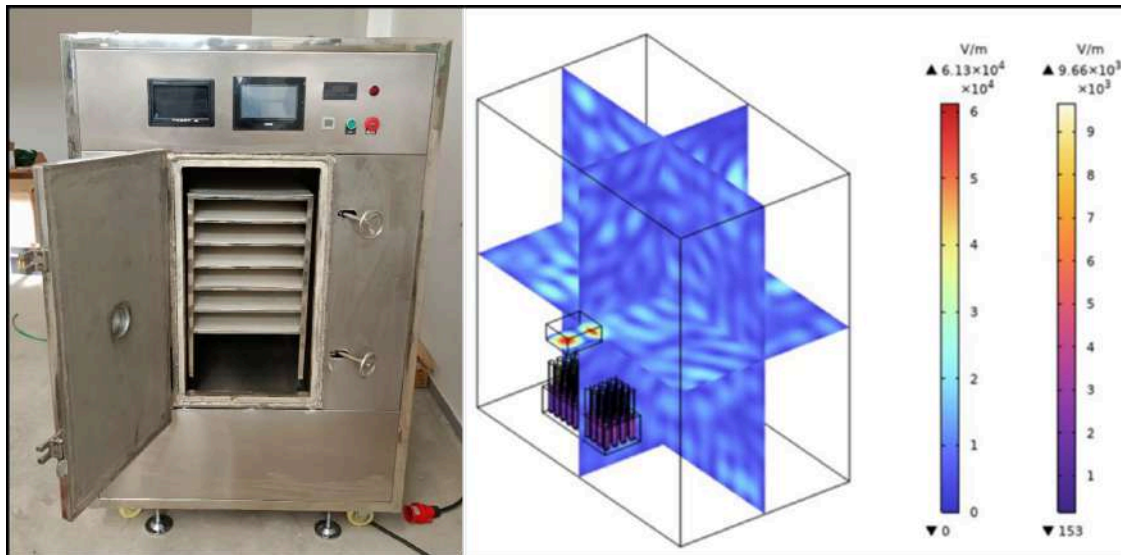
## SMART DRYING TECHNOLOGIES FOR ALGAE PROCESSING

The MW-assisted Microalgae Drying System has been constructed and is now going through an optimisation process of the operating conditions. In this system, vacuum is

maintained in the chamber with the frozen samples of microalgae while MW radiation is applied, enhancing the water sublimation and, therefore, achieving a fast drying while preserving the biochemical characteristics of the samples.

Regarding the macroalgae MW-assisted device, the system dehumidifies algae on trays through radiative and convective heat transfer. Microwaves dry algae internally, while forced airflow removes moisture, aided by preheated air for efficient convective heat transfer. Humidity and temperature sensors ensure consistent drying.

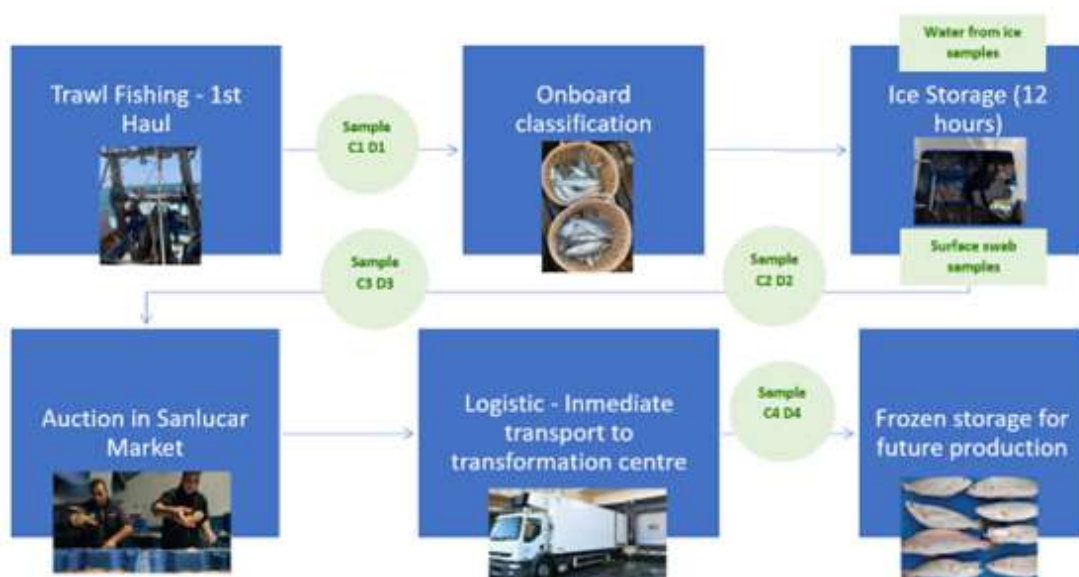
For both systems, numerical simulations have been used to optimised the design. Additionally, machine learning algorithms are being developed to optimise biomass positioning, enhancing uniformity and drying speed. These efforts collectively aim to boost efficiency and align with the NOVAFOODIES project's goals.



Already constructed MW-assisted device for microalgae drying (left) and numerical simulations (right) of the electric field inside the microwave system. The simulations help to optimise the biomass position within the cabinet.

## SUSTAINABLE FOOD FROM BYCATCH

Validation tests showed that the use of the selected low commercial value species (*Cynoscion regalis*) and the promising green alga (*Ulva ohnoi*) is viable from the perspective of logistical processing, as well as fulfilling microbiological and organoleptic aspects.

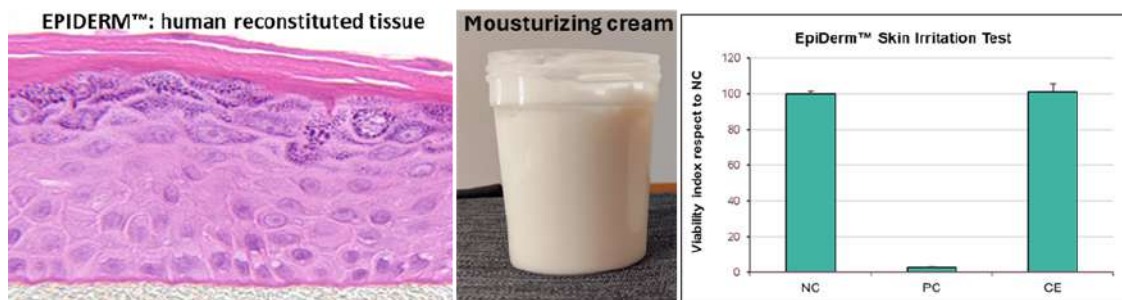




## INNOVATIVE FORMULATIONS AND BIOSECURITY FOR NOVEL APPLICATIONS

Common protocols or the determination of the functional properties of the seaweeds *Alaria esculenta*, *Ericaria Amentacea*, *Ulva ohnoi* and *Codium taylorii* were assessed and executed. Aqueous extracts from fresh *Codium* and *Ulva* were found to inhibit the growth of the pathogenic bacteria *Staphylococcus aureus*. *Alaria* and *Ericaria* were rich in total phenol and flavonoid contents (antioxidants) and consequently showed high antioxidative properties. Hence, these species demonstrated good nutritional properties and potential to develop new functional foods.

*Ericaria* showed good photoprotective and antiaging properties. A first formulation of a facial serum and moisturizing cream with this alga was obtained showing no toxicity and a significant anti-inflammatory effect on LPS-treated EpiDerm™ human reconstituted tissue.



Human EpiDerm™ skin irritation test (OECD n° TG439) on human reconstructed tissue. NC: not treated control, PC: positive control, CE cream+extract

Thusfar, partners developed 15 novel food products containing biomass of seaweeds, microalgae or fish hydrolysate. Products include gluten-based bread, gluten-free bread, hamburgers, sausages, liver pate, energy bars, smoothies (TUCN, Romania), and “On the go” crackers and gluten-free instant pasta (still in testing phase) (Yotis, Greece). A sensory analysis of the products from Romania under 560 potential consumers showed the highest acceptability for 5% *Alaria* gluten-based bread and 5% *Gracilaria*-based sausage, which will be characterized in terms of physicochemical properties and shelf life. The crackers also showed good public acceptance.

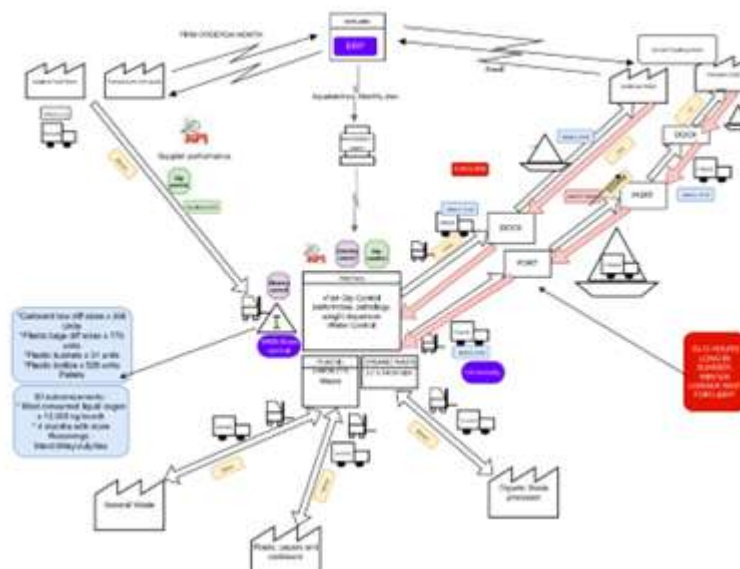
First biosafety tests on raw materials and first products showed optimal microbiological quality (absence or negligible numbers of food pathogens) in fresh and preserved seaweed. First toxicity tests with respect to polycyclic aromatic hydrocarbons (PAHs) showed that all samples were considerably lower than the maximum allowed value of 0.8 µg/kg.

## DIGITAL TOOLS FOR TRACEABILITY AND TRUST

One of the key tasks within the NOVAFOODIES project is the design of a theoretical optimized and efficient logistics supply chain in the aquaculture sector, including the integration of reverse logistics to enhance sustainability and efficiency. This is especially critical in the fisheries and algae production sectors, where supply chain complexities, waste management, and resource utilization present significant challenges.

To address these issues, an in-depth analysis of three pilot cases—two fisheries and one algae production site (Aqua de Ma – University of Genoa, Italy; Kefalonia Fisheries, Greece; YSFRI, China)—was carried out using Value Stream Mapping (VSM), among other tools, as a support and visual method for assessment. This methodology enabled

the visualization of material, information, and process flows within each supply chain, identifying inefficiencies and opportunities for improvement.



The analysis focused on evaluating current supply chain practices, industry standards, levels of automation, and the degree of digitalization within operations. These insights establish a comprehensive baseline to inform future optimization strategies. Targeted solutions are being designed to improve logistical flows, reduce waste, and promote efficient resource use. Additionally, the role of digital tools and automated systems is being assessed to streamline operations, enhance traceability, and increase overall efficiency.

In the upcoming phases of the project, these findings will contribute to the development of best practices and innovative approaches that support integrated, sustainable supply chains and long-term industry growth. By addressing inefficiencies and implementing optimized logistics processes, NOVAFOODIES aims to set a precedent for operational improvement across the fisheries and algae production sectors.

## TOWARDS SUSTAINABLE, INCLUSIVE AND STANDARDISED SOLUTIONS

To deliver the best outcomes, NOVAFOODIES integrates sustainability, inclusivity, and standardisation throughout the project. Life Cycle Assessments (LCA) are conducted during the project to improve the environmental performance of innovations across the value chain. These assessments, supported by regular input from project partners, also consider economic viability through baseline comparisons and analyse social impacts on workers' well-being and equity. Inclusivity is addressed by identifying challenges and promoting good practices with partner input and alignment with other projects. Knowledge gained is shared through multilingual training, webinars, and e-learning to support employability. Finally, a standardisation roadmap has been created to guide future actions, ensuring that project results are scalable and aligned with safety and quality standards.

**DISCOVER MORE**



### EXPLORE OUR ZENODO COMMUNITY

In under two years, NOVAFOODIES has published numerous updates, accessible via the Zenodo community. These publications reflect the project's

dedication to sustainable food production through innovative research.

[LINK](#)



## PARTICIPATE IN THE IMTA INGREDIENTS QUESTIONNAIRE

The NOVAFOODIES project invites you to share your insights on Integrated Multi-Trophic Aquaculture (IMTA) ingredients for human consumption. Your input will help advance sustainable aquaculture practices.

[LINK](#)



## NOVAFOODIES PROJECT VIDEO

[LINK](#)



## INNOVATIVE AQUACULTURE SYSTEMS VIDEO

[LINK](#)

## UPCOMING EVENTS

The results of the NOVAFOODIES project will be presented at the following events:



### Aquaculture Europe 2025

Dates: September 22–25, 2025

Location: Valencia, Spain

[LINK](#)

## MORE INFORMATION



Co-funded by  
the European Union