

NewTechAqua

New technologies, Tools and Strategies for a Sustainable,
Resilient and Innovative European Aquaculture



Recommendations for a more resilient EU aquaculture

The European Commission has stressed the potential of aquaculture as a source of high-quality protein for food with a low-carbon footprint. The European Green Deal and the Farm to Fork Strategy both underline that aquaculture has an important role to play in helping to build a **sustainable food system**. Additionally, the aquaculture sector creates jobs and **economic development** opportunities in the EU's coastal and rural communities. These documents also highlight that aquaculture can help to **decarbonise the economy**; fight climate change and mitigate its impact; reduce pollution; contribute to better **preserving ecosystems** (in line with the objectives of the Biodiversity Strategy and the Zero-pollution ambition for a toxic-free environment); and be part of a more **circular management of resources**.

Bringing **new technologies** into the aquaculture sector offers a range of benefits that are transforming the industry and driving its growth. These innovations are essential for meeting the growing demand for seafood while reducing the industry's impact on the environment. The **NewTechAqua project** has contributed to expand and diversify European aquaculture production of finfish, molluscs and microalgae by developing and validating technologically advanced, resilient and sustainable **solutions**.

This policy paper summarises the EU policy context for aquaculture and presents research results and recommendations on seven strategic topics.

Policy context

Aquaculture, unlike fisheries, is not an exclusive EU competence, meaning there is no unified aquaculture policy, with several regulations dealing with aquaculture at EU level. To provide clear policy recommendations, understanding the latest legislative proposals, action plans, and strategies influencing the aquaculture sector is crucial.

The European Green Deal **(2019)** constitutes the primary and most influential incentive in place. It is the EU's new growth strategy, which aims to transform the EU into a fair and prosperous society, with a modern, resource-efficient and competitive economy. The EU Green Deal aims for net-zero greenhouse gas emissions by 2050, decoupling economic growth from resource use. It focuses on protecting natural capital, ensuring citizen well-being, and aligning with the UN's 2030 Agenda for sustainable development.

The Farm to Fork Strategy **(2020)** is at the heart of the European Green Deal, aiming to make food systems fair, healthy and environmentally-friendly. It is mentioned that "farmed fish and seafood generate a lower carbon footprint than animal production on land".

Other policy documents include:

- Biodiversity Strategy for 2030 **(2020)** aims to restore the good environmental status of marine ecosystems and restoring freshwater ecosystems.
- **European Bioeconomy Strategy**: The 2022 EU Bioeconomy Strategy progress report underscores the potential of algae or shellfish aquaculture, not only as biomass sources but also as tools for

bioremediation. These aquaculture practices have demonstrated their ability to remove nutrients, carbon, and pollutants from marine waters.

- **Circular Economy Action Plan (2020)** includes a targeted reduction by 50% in nutrient losses, the use and risk of chemical pesticides, especially the more hazardous ones, and the sale of antimicrobials used in farmed animals and aquaculture. Additionally, with an estimated 20% of the EU's total food production being lost or wasted, there is a specific emphasis on tackling food waste through dedicated reduction targets. This approach aims to foster more sustainable practices within agriculture, food production, and animal husbandry while minimising environmental impact and maximising resource efficiency across the European Union.
- **Sustainable Blue Economy (2021)** highlights the importance of responsible food systems, emphasising sustainable aquaculture practices. This approach aims to complement the natural limits of wild captures by promoting the cultivation of algae as an alternative to traditional agriculture. Sustainable aquaculture is recognised as a valuable, low-impact source of both food and feed.
- **Organic Action Plan (2021)** sets forth ambitious goals, aiming to achieve "at least 25% of the EU's agricultural land under organic farming" and a substantial upsurge in organic aquaculture by 2030. The plan encompasses various initiatives related to aquaculture, including the identification of specific obstacles impeding the growth of organic aquaculture within the EU.
- **EU Mission Restore our Ocean and Waters by 2030 (2021)** addresses the development of zero-carbon and low-impact aquaculture practices while advocating for the promotion of circular, low-carbon multi-purpose utilisation of marine and water spaces. A significant focus lies on creating solutions for zero-carbon and toxin-free aquaculture and algae production compatible with vulnerable marine ecosystems.
- **Food 2030 Pathways for Action** states that food from the oceans and freshwater resources represent crucial R&I steps in the transition to a resilient blue economy, and inclusive affordable food systems. Fisheries and aquaculture are a vital pathway for sustainable seafood production.
- **EU Protein Strategy (upcoming)** highlights how the EU livestock sector is critically dependent on imports of plant-based proteins for animal feed, and will address how to reduce the EU's protein deficit.
- **EU Algae Initiative (2022)** states that the European algae sector has the potential to become a significant part of the EU blue bioeconomy.
- Additional relevant policies including the **Common Fisheries Policy (CFP)**, **Common Market Organisation (CMO) review** and **Zero Pollution Action Plan (2021)**.

Finally, in 2021, the European Commission adopted the [Strategic guidelines for a more sustainable and competitive EU aquaculture \(2021\)](#). The guidelines provide common ground for aquaculture stakeholders to develop the sector in line with the EU Green Deal and in particular the Farm to Fork Strategy. The guidelines also aim to help the EU aquaculture sector to become more competitive and resilient, and to improve its environmental and climate performance. The document identified 13 strategic areas where specific intervention is needed to overcome the related challenges. The NewTechAqua project contributes to the improvement of 7 of the strategic areas, that are listed below. Policy recommendations are included for each of the strategic areas.

1 Environmental Performance & 2 Climate Change

NewTechAqua successfully developed organic, low fishmeal aquafeed suitable for both traditional and emerging fish species, reducing reliance on traditional feed sources. The project actively advocated for **sustainable aquaculture systems** by employing green technologies. It compared various in-land fish farming methods, evaluating their productivity, biological performance, resilience, and sustainability

concerning water and land usage, while considering specific target species. Additionally, the project significantly contributed to understanding the diversity of microbial communities in different inland fish farming systems and feeding practices, exploring their impact on fish health.

Outputs

- D1.5 Report on lab scale evaluation of new organic diets in trout, seabream and meagre
- D1.6 Report on the industrial scale for organic diets in seabream
- D2.3 Dynamic model of a seabass/seabream inland fish farm
- D2.4 Modelling system for the eco-intensification of a seabass/seabream inland fish farm

NewTechAqua also promoted marine by-product valorisation by employing innovative free-catch fishmeal diet for seabass.

Outputs

- D1.3 Report on the evaluation of zero-waste diet containing fish by product on overall performance of European seabass
- D1.4 Report on industrial scale evaluation of two free catch fishmeal diets for seabass

Recommendations

- Review the restrictions in the EU regulation on the use of certain animal by-products for feed in aquaculture.
- Help the valorisation of already available fish by-products.
- Better valorisation of aquaculture side-streams such as sludge, solid waste and residues from animal origin.
- Further research is needed for the use of waste as feed and for circular and zero waste diets, and regulations might need to adapt.
- Sustainability and circular indicators still need to be better defined.
- Further smart breeding programme for climate resilience, impact forecasting and impact assessment methodologies are needed, as is research on new resilient aquaculture systems.
- Further development is required on the use of satellite data.

The following recommendations relate specifically to **organic aquaculture**:

- Review of organic regulation to allow the use of additional feed ingredients.
- Harmonising implementation and provide guidance in Member States and support exchange of good practices in Member States.
- Support investments for the research for organic feed ingredients.
- Better consumer awareness about organic aquaculture and sustainable aquaculture.
- Possible inclusion of aquaponics.
- Due to challenges in organic aquaculture, the focus should be given to sustainability.

3 Diversification and adding value

Research was conducted by NewTechAqua to close the reproductive cycle of three economically very important new/emerging species for Mediterranean aquaculture: the meagre (*Argyrosomus regius*), greater amberjack (*Seriola dumerili*) and Senegalese sole (*Solea senegalensis*).

Outputs

- D4.1 Sex differentiation and sex ratio in hatchery-produced F1 greater amberjack
- D4.2 Timing of puberty in hatchery-produced F1 greater amberjack
- D4.3 Gametogenesis in hatchery-produced greater amberjack
- D4.4 Report on induction of gametogenesis and spawning using natural-like hormones in greater amberjack
- D4.5 Report on broodstock management software for greater amberjack broodstock
- D4.6 Report on a web-based reproductive function and site selection platform for greater amberjack broodstock
- D4.7 Report on spawning kinetics of individual greater amberjack, and male parentage contribution
- D4.8 Report on spawning of groups of breeders in large tanks with/without the use of hormonal therapies and parentage contribution

NewTechAqua exploited innovative processing technologies and formulations for the preparation of high-quality fish and mollusc products with improved stability and functionality, in order to valorise aquaculture raw materials. This objective was addressed by applying sustainable non-thermal technologies (cold gas plasma, pulsed electric fields, static high-pressures) that could be combined with cold formulation technologies (vacuum and high-pressure impregnation, marinating) and new formulations. Processing parameters and ingredients were to reach the desired physico-chemical, microstructural, functional and stability characteristics, and to further expand new potential market and destinations of innovative products.

Outputs

- D5.1: Protocols and parameters for optimal treatment with PEF in relation to quality and stability parameters of the final seabass product
- D5.2: Protocols and parameters for optimal treatment with HPP in relation to quality and stability parameters of the final fish products
- D5.3: Protocols and parameters for optimal treatment with cold plasma in relation to quality and stability parameters of the final oyster product
- D5.4: Prototype of at least four innovative minimally processed seafood products with high nutritional value and desired sensorial characteristics
- D5.5: Novel formulated minced products from organic meagre

Recommendations

- The introduction to the market of new species and products needs to be supported by all stakeholders.
- Sustainable and climate-friendly products, with reduced energy used during processing needs to be better promoted towards consumers.

4 Animal health and public health & 5 Animal welfare

The project made significant contributions in researching **feed and feeding strategies**. One focus was on reducing *Sparicotyle chrysophrii* infections in seabream by utilising natural functional diets, aiming to improve their overall health. Additionally, the project delved into the application of microbiome techniques to bolster the health of farmed species, specifically exploring how different feeding regimes impact the microbiome and subsequently the overall health of these species. By investigating these areas, the project

aimed to offer innovative strategies for mitigating infections and promoting better health among farmed fish through dietary and microbiome-related interventions.

The project offered valuable tools for sustainable health management and epidemiologic studies, employing Big Data analysis and current models to screen and analyse outbreaks, focusing on Atlantic salmon as a model species. Additionally, it provided the shellfish industry with enhanced health tools like biosensors for pathogen detection, enabling better production management through satellite image analyses utilised for modelling purposes. Moreover, the project extensively investigated the biodiversity of microbial communities within various inland fish farming systems and feeding practices, emphasising the critical role of microbiota in impacting fish health.

NewTechAqua also researched how to unravel the genetic architectures and set up genomic selection schemes for the multifactorial and interacting herpes and vibrio diseases in Pacific oyster.

Outputs

D1.7 Report on microbiome data to assess and modulate fish health
D2.1 Epidemiological models using Big Data analysis and AI to control disease transmission in salmon
D2.2 Guidelines describing methods for the deployment of AI models for disease control in the Mediterranean
D2.12 Report on the microbiome profiling of different farming systems and fish host
D2.8 Biosensor prototype for the detection of *V. parahaemolyticus*
D2.9 Biosensor prototype in the analysis of samples from shellfish farming systems
D2.12 Report on the microbiome profiling of different farming systems and fish host
D3.3 Report on genomic selection and gene mapping for Pacific oyster herpes and vibrio diseases
D3.4 Report on the effects of high energy diets on fish health and quality of selected seabass families
D6.5 Social and health assessment

Lastly, the project provided tools for sustainable health management and epidemiologic studies by means of Big Data analysis based on current models, screening and outbreaks using Atlantic salmon as a model.

Outputs

D2.5 Report on biological, welfare and productive results of grey mullet reared in BFT and ELOXIRAS®
D2.6 Report on biological, welfare and productive results grey mullet reared in RAS and aquaponics

Recommendations

- Due to climate change and other reasons, emerging pathogens continuously challenge the sector, and individual reactions are not efficient.
- Harmonised procedures and actions are needed to predict and prevent diseases.
- Implementation of research results in this respect should be better communicated and trainings should be supported at Member State level.
- Most research results should be picked up and used by EU institutions to develop guidance documents for Member States.

6 Low-trophic aquaculture

NewTechAqua developed experimental techniques to apply a breeding programme on selected microalgae strains for the improvement of growth/production properties and biochemical characteristics related to lipid, fatty acids and carotenoid metabolism.

Outputs

- D3.1 Protocol for gametogenesis of microalgae
- D3.2 Report on microalgae breeding programme

Recommendations

- Further breeding programme to contribute to the EU Algae Strategy.
- Further communication about the use of algae.

7 Communicating on EU aquaculture

NewTechAqua implemented a Pan-European awareness raising campaign as well as training activities. Educational materials were developed to raise awareness about the quality of European aquaculture products and the sustainability of production systems across Europe. A special campaign addressed several schools over Europe. Additionally, co-creation processes were performed in three EU countries (Spain, France and Italy) involving stakeholders of the fish chain in order to explore new potential mechanisms to increase consumer awareness of European aquaculture and the acceptance of the new aquaculture technologies, practices and products developed in NewTechAqua. Finally, three studies were developed to test different communication procedures.

Outputs

- D8.5 Pan-European awareness raising campaign
- D8.6 Education activities and training report
- D8.7 Consumer awareness on sustainable European aquaculture

Recommendations

- Awareness raising and communication efforts are needed addressing schools and children.
- Aquaculture 4.0 projects outputs on communications (survey results etc.) are to be used by Members States preparing national communication campaigns.

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More information about NewTechAqua and its results is available here: www.newtechaqua.eu