European Commission

Research and Innovation



Innovation in Aquaculture

A SYNERGY INFO PACK
BY CORDIS

Editorial

Aquaculture – the farming of aquatic organisms such as fish, shellfish and algae, among others – is one of the fastest-growing food production sectors in the world. The EU alone farms an estimated 1 million tonnes of fish, molluscs, algae and crustaceans every year, with a value of approximately EUR 4.6 billion. The sector's 14 000 enterprises – many of which are family-owned micro and small businesses – also directly employ around 57 000 people.

While these numbers may look impressive, the reality is that the EU represents less than 1 % of global aquaculture volume. And while aquaculture globally has seen a 54 % increase in production over the past decade, production in the EU has declined since 2017.

What's driving this lack of growth?

EU aquaculture has specialised over the years, and is now dependent on just a handful of species, namely salmon, trout, mussels and sea bass – many of which require high-resource feed. This lack of diversity also means Europe is reliant on imports for much of its seafood, which further increases the sector's environmental footprint.

Another factor preventing growth is that the EU's available aquaculture space is vastly underused compared to comparable regions. Even with nearly 68 000 km of coastline and more than half a million natural lakes, 67 % of the EU's aquaculture production is concentrated in just four Member States: France, Greece, Italy and Spain.

The EU is looking to turn the tide on aquaculture production. But growth cannot come at the expense of its ambitious climate goals. This means aquaculture needs to be scalable, but also sustainable. To achieve this, the EU adopted the Strategic guidelines for a more sustainable and competitive EU aquaculture. Research and innovation play an important part in these guidelines.

By supporting research, innovation and implementation projects that deliver new technologies, training, regulation and value chain enhancements, EU funding programmes such as Horizon Europe, the European Maritime, Fisheries and Aquaculture Fund (EMFAF) and the LIFE programme are working collaboratively to achieve the EU's strategic aims in the sector.

This Synergy Info Pack highlights 26 EU-funded projects overseen by the DirectorateGeneral for Research and Innovation (DG RTD) and the European Climate, Infrastructure and Environment Executive Agency (CINEA) that reflect how this pluralistic approach fosters a strong, reciprocal research and innovation ecosystem.

In the following pages you'll discover how bio-based antibiotic alternatives can sustainably prevent fish diseases and why fungi and insects can be used as sustainable alternative ingredients to soy- and fishmeal-based aquafeed. You'll also learn what researchers are doing to increase the production of organic aquaculture in Europe.

But it's not just fish and shellfish production that are benefiting from EU-funded research. Innovative solutions are also being developed to increase algae farming, reuse fish waste, integrate aquaculture into offshore wind farms and municipal wastewater treatment plants, and train the next generation of aquaculture professionals.

Together, they show how EU research and innovation funding is turning the tide towards a competitive, climate-neutral and resilient aquaculture sector in the EU.

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Chapter 1

A new approach to farmed fish

From preventative medicine to alternative feeds, these projects are accelerating sustainable finfish production for a more resilient industry.

Finfish production plays a vital role at the heart of the EU's aquaculture sector, contributing a significant share of the EU's annual aquaculture yield. As the sector continues to grow, there is an opportunity to further enhance fish health and farming practices, particularly in environments where stock can be more vulnerable to disease.

This is driving innovation across finfish farming, with increasing efforts to reduce reliance on antibiotics and develop more sustainable approaches that support animal health, protect the environment and respond to food safety and antimicrobial resistance concerns.

The **Cure4Aqua** and **IGNITION** projects are helping to wean finfish production off antibiotics. Both shift the focus away from reactive disease treatment and towards disease prevention. Not only are these projects developing bio-based alternatives to antibiotics, they are also using selective breeding and new diagnostic technologies to prevent outbreaks and ensure a healthier, more sustainable approach to finfish production.

A protein shake-up in aquaculture

Growing finfish also require a lot of feed. Today's feed ingredients are largely derived from fishing industry by-catch and soy, protein sources that are linked, in some cases, to overfishing and deforestation respectively.

Interest in sustainable alternative ingredients is increasing. The **AquaPekilo** project proposes aquaculture feed made from fungi, while the **InnovaFeed** project explores the potential of farmed insects.

Both show there is promise in alternative proteins that offer similar nutritional benefits to traditional feed ingredients but at a lower economic and environmental cost.

Leveraging the potential of organic aquaculture

While disease prevention and alternative feeds are two pieces of aquaculture's sustainability puzzle, organic finfish farming has the potential to fit these pieces together.

Helping to put this potential into practice are the projects **EUAqua.Org** and **SelectOrganic**.

Dedicated to enhancing the organic farming of such finfish species as Atlantic salmon, European sea bass and rainbow trout, the two projects are developing a portfolio of digital solutions, reproduction technologies and selective breeding programmes to increase the production of organic aquaculture in Europe.

Future-proofing finfish production

While finfish production has always been at the heart of Europe's aquaculture success, making this production more sustainable is the key to future-proofing the sector against the challenges ahead.

Thanks to the innovative solutions being developed by the projects highlighted in this chapter, that future is starting to look both resilient and bright.

Robust fish for a resilient industry

From diagnostics to vaccines and selective breeding programmes, the Cure4Aqua project's innovative solutions look to prevent aquatic animal diseases.

Healthy fish are the foundation of a resilient and thriving EU aquaculture sector. That's why the Cure4Aqua project is developing vaccines designed to protect farmed seafood against some of the most threatening pathogens. The project is also creating selective breeding programmes to help fish better manage disease, technologies for detecting and diagnosing diseases, and bio-based alternatives to the antibiotics currently used to control pathogens. The net result is a safer, healthier and more resilient approach to seafood production.

Cure4Aqua

Project name

Curing EU aquaculture by co-creating health and welfare innovations

Funded under

Horizon Europe: Food, Bioeconomy, Natural Resources, Agriculture and Environment

Coordinated by

Czech Academy of Sciences in Czechia

Duration

1 November 2022 – 30 April 2027

Find out more

cure4aqua-project.eu



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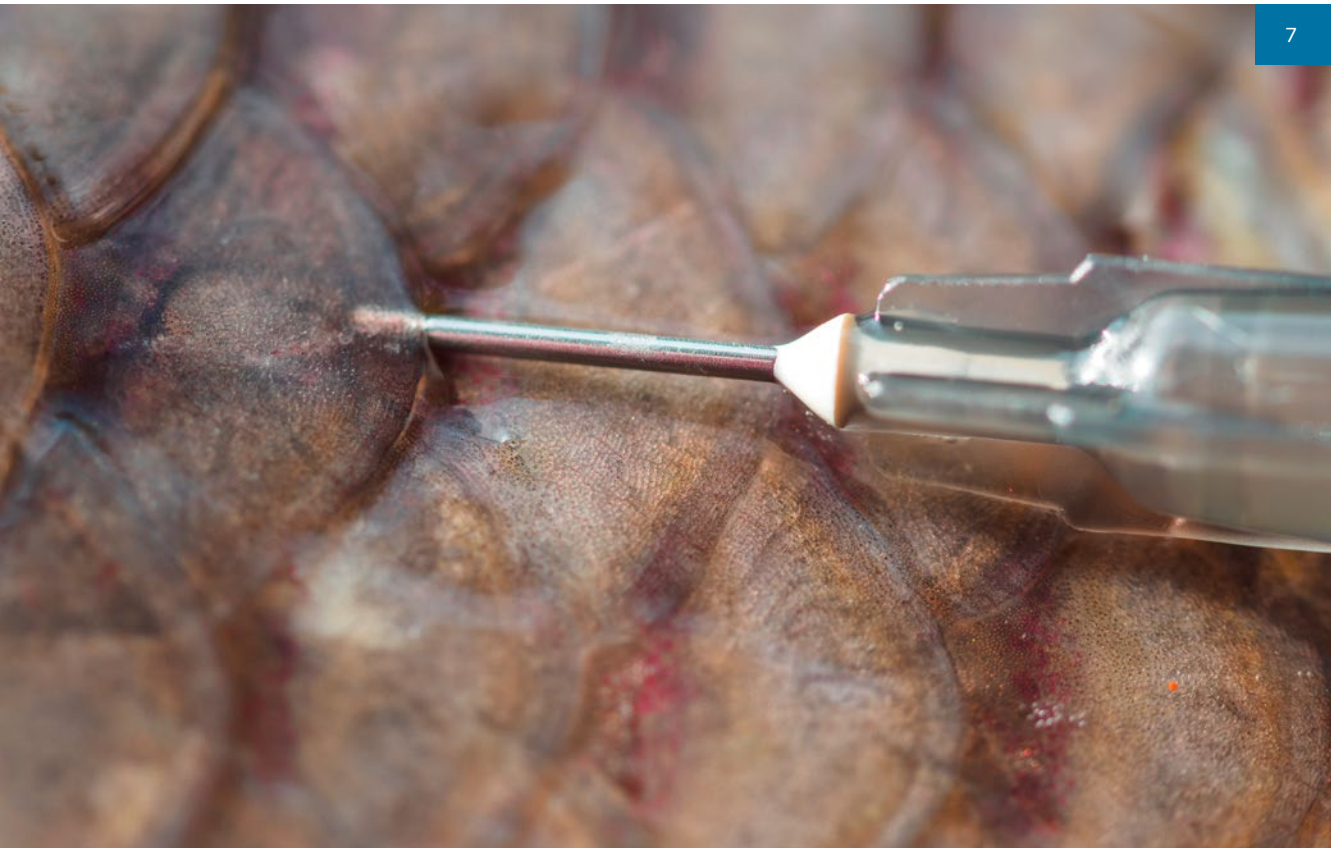

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When prevention is the best medicine

For the IGNITION project, protecting aquaculture from the devastating impacts of disease starts with improving animal health.

They say prevention is the best medicine, and fish are no exception. To help Europe's aquaculture sector better prevent disease amongst fish and shellfish, the IGNITION project is developing new techniques in genotyping and molecular phenotyping that could pave the way to fish and shellfish breeds that are more robust against stress and disease. The project is also working to develop vaccines for preventing diseases, as well as machine learning solutions for predicting and diagnosing disease.

IGNITION

Project name

Improving GreeN Innovation for the blue revoluTION: new tools and opportunities for a more sustainable animal farming

Funded under

Horizon Europe: Food, Bioeconomy, Natural Resources, Agriculture and Environment

Coordinated by

Interdisciplinary Centre of Marine and Environmental Research in Portugal

Duration

1 November 2022 – 31 January 2027

Find out more

ignition-project.eu

Opening the door to organic aquaculture

EUAqua.Org is paving the way towards sustainable seafood production through improved breeds and training programmes.

Aquaculture can offer a path towards food security, but that path must also lead towards food sustainability. Blazing the way is EUAqua.Org, a project dedicated to enhancing the organic farming of Atlantic salmon, European sea bass, gilthead sea bream and rainbow trout. The project is developing the phenotyping, genotyping and genomic prediction technologies needed to advance sustainable organic aquaculture, and providing the necessary training to ensure these tools are being readily used by breeding companies and fish farmers.



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EUAqua.Org

Project name

Integrative breeding strategies for the transition of EUropean AQUAculture towards sustainable ORGanic production

Funded under

Horizon Europe: Food, Bioeconomy, Natural Resources, Agriculture and Environment

Coordinated by

University of Padua in Italy

Duration

1 January 2025 – 31 December 2028

Find out more

euaqua.org

Boosting organic fish farming in Europe

With a focus on fish welfare and selective breeding, SelectOrganic aims to unlock the full potential of organic aquaculture.

Organic aquaculture has the potential to answer Europe's call for sustainable seafood. Unlocking that potential requires significantly increasing production. With the goal of increasing the resilience of farmed fish species, SelectOrganic is developing selective breeding programmes to naturally enhance a fish's robustness in the face of bacterial disease and heatwaves. It is also creating new feed and reproduction technologies, as well as fish welfare indicators – all of which will help increase the production and competitiveness of organic aquaculture in Europe.

SelectOrganic

Project name

Development of selective breeding programs for boosting organic fish farming that respect high animal welfare requirements, maintain biodiversity and improve fish health and resource efficiency

Funded under

Horizon Europe: Food, Bioeconomy, Natural Resources, Agriculture and Environment

Coordinated by

Nofima in Norway

Duration

1 September 2025 – 28 February 2029

Find out more

selectorganic.eu



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© Joosu Kuivanen

A sustainable alternative to soy-based aquafeeds

The AquaPekilo project aims to market a sustainable, cost-effective aquaculture feed protein made from fungi.

A growing aquaculture sector means more fish to feed. Doing so sustainably requires finding alternatives to soy and marine ingredients such as fishmeal and fish oil currently used in aquafeeds, linked, in some cases, to deforestation and overfishing respectively. AquaPekilo proposes a cost-effective, locally produced and sustainable aquaculture feed ingredient rich in protein made from fungi. Working with the aquafeed and biorefining industries, the project conducted trials demonstrating the benefits of this innovative protein ingredient – an important first step to scaling up production and bringing a more sustainable aquafeed to market.

AquaPekilo

Project name

Replacing soy with Pekilo protein in aquafeed

Funded under

European Maritime and Fisheries Fund (EMFF)

Coordinated by

EniferBio in Finland

Duration

1 October 2021 – 30 September 2024

Find out more

enifer.com

Farming insects to feed farmed fish

The InnovaFeed project proposes insect-based fish food as a sustainable alternative to soy-based feeds.

Europe doesn't grow enough soy to produce its own animal feed, meaning that the aquaculture industry is reliant on imports, limiting its sustainability. InnovaFeed proposes an alternative: using insects as a source of protein for fish feed. By building an insect rearing facility, deploying new production factories across Europe, implementing a circular value chain, and creating feed solutions formulated for aquaculture species, the project has secured several commercial contracts with leading industry players.



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InnovaFeed BEW 2019

Project name

Support InnovaFeed in its next level innovation and industrial deployment across Europe

Funded under

European Maritime and Fisheries Fund (EMFF)

Coordinated by

Innovafeed in France

Duration

1 October 2020 – 30 September 2023

Find out more

innovafeed.com/en

Chapter 2

Cultivating the benefits of algae

Innovative solutions look to increase sustainable algae production while also leveraging its climate and environmental benefits.

Hidden beneath the water's surface, the huge potential of algae is easily overlooked. Both microalgae and macroalgae can serve as a sustainable and nutritious source of food for humans, livestock and fish, as well as fertiliser for crops, and can clean our wastewater. As a natural carbon sink, algae can even help mitigate climate change.

To leverage all these benefits, the EU is working intensively to scale algae farming. It does this both through strategic guidelines such as the EU Algae Initiative, as well as by funding innovative research projects, seven of which are highlighted in this chapter.

One of those projects is **OCEAN GARDENS**. The project aims to build a 40 000 m² floating seaweed farm in Gran Canaria capable of producing 300 tonnes of dry biomass per year at a lower cost than traditional line-based methods.

Finding space to scale up production

The floating farm concept serves as a model for scalable aquafarming, and demonstrates the importance of maritime spatial planning for scaling up seaweed production. Despite the size of oceans and seas, suitable space can be a limited commodity with many competing demands.

That's why projects **OLAMUR** and **ULTFARMS** are working to integrate algae farming into existing offshore wind farms. By co-locating what could be seen as competing interests, the projects show a single site can provide emission-free energy and sustainable seafood.

Bringing regenerative ocean farming to Europe

Another innovative approach to sustainably increasing algae production is regenerative ocean farming (ROF). ROF is a nature-based approach to aquaculture that cultivates unfed, low-trophic species such as seaweeds and bivalves. These organisms are cultivated not just for harvest but for the ecosystem services they provide: seaweeds absorb excess nutrients and carbon dioxide, while shellfish filter water. In helping to remediate environmental conditions, they embed conservation benefits within aquaculture practices.

Two projects working to position ROF as a model for the large-scale production of seaweed are **SEAGROW** and **COOL BLUE BALTIC**. The former is building a farm designed to produce 5 000 tonnes of seaweed annually in Ireland's Galway Bay, while the latter is bringing the benefits of ROF to Baltic farmers, fishers and coastal communities.

Linking up the algae value chain

But growing more algae isn't enough to increase production. It also requires a streamlining of the entire value chain, from production to processing and marketing towards end consumers.

Projects **ATL.A.HUB** and **EU4ALGAE** are building platforms where algae researchers, farmers, producers, entrepreneurs, investors and public authorities can come together to engage, build community and share resources.

By uniting EU algae stakeholders, the two projects are driving scalable and sustainable production and increasing European competitiveness while also taking full advantage of algae's many climate benefits.



© Mads Hecter (Kerteminde Seafarm) and Teis Boderskov (Aarhus University)

Winds of change for seafood production

As Europe's offshore renewable energy sector grows, so too does the potential for using low trophic aquaculture as a means of increasing seafood production.

As well as being a sustainable means of producing seafood, low trophic aquaculture (LTA) helps absorb excess nutrients and carbon from the ocean. Spotting an opportunity to marry Europe's aquaculture and energy goals, the OLAMUR project is working to co-locate LTA farms within offshore wind farms to provide emission-free energy, nutritious seafood and restorative ecosystem services all from one site. The project is currently demonstrating commercial solutions for growing seaweed and blue mussels within three established wind farms in the North and Baltic Seas.

OLAMUR

Project name

Offshore Low-trophic Aquaculture in Multi-Use Scenario Realisation

Funded under

Horizon Europe: Food, Bioeconomy, Natural Resources, Agriculture and Environment

Coordinated by

Institute of Marine Research in Norway

Duration

1 January 2023 – 31 December 2026

Find out more

olamur.eu



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Plugging aquaculture into the energy infrastructure

Using wind farms as anchors, ULTFARMS looks to increase aquaculture production in harsh offshore conditions.

The North and Baltic Seas are notoriously wild and windy. While these conditions are ideal for offshore wind farms, they make anchoring low trophic aquaculture (LTA) species such as seaweed and mussels nearly impossible. But what if LTA farms were integrated into existing offshore wind farms, using the wind infrastructure as anchors? That's the thinking behind the ULTFARMS project, which is developing the engineering, technical, ecological and biological processes needed to make this happen. The project is testing longlines, anchors, tube and net systems, delineation buoys and other solutions that can be used to farm seaweed, blue mussels and oysters within offshore wind farms.

ULTFARMS

Project name

circUlar Low Trophic oFfshore Aquaculture in wind farms and Restoration of Marine Space

Funded under

Horizon Europe: Food, Bioeconomy, Natural Resources, Agriculture and Environment

Coordinated by

Deltares Foundation in the Netherlands

Duration

1 January 2023 – 31 October 2026

Find out more

ultfarms.eu

Growing Europe's algae industry

Bringing together Europe's algae stakeholders, EU4ALGAE aims to drive sustainable growth in the industry.

The EU Algae Initiative is Europe's roadmap for developing a strong, sustainable and competitive algae sector. Turning this ambition into concrete actions is EU4ALGAE. As the European Commission's flagship stakeholder platform for the algae sector, EU4ALGAE serves as a one-stop shop for knowledge sharing, policy engagement and community building across the full algae value chain. It currently has 1 200 registered members, including researchers, farmers, producers, entrepreneurs, investors and public authorities. To further enhance the platform, the project is now working to add an Algae Farmers Toolkit, algae industry roadmap, best practices in carbon and nutrient credit schemes, and consumer awareness campaign.



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EU4ALGAE

Project name

EU4ALGAE – Stakeholder Platform and Algae Farmers Toolkit

Funded under

European Maritime, Fisheries and Aquaculture Fund (EMFAF)

Coordinated by

EABA in Italy, EurA and s.Pro in Germany

Duration

7 January 2022 – 6 January 2029

Find out more

link.europa.eu/cjffvtkn

Unlocking seaweed's multitude of benefits

Ocean-grown seaweed could provide a sustainable feedstock for decarbonising the transport and chemical industries. OCEAN GARDENS aims to reap these rewards.

A natural source of hydrocarbons – or a means for sequestering them – seaweed has many potential uses. OCEAN GARDENS is a pioneering project developing large-scale offshore seaweed farms. It aims to build a 40 000 m² floating seaweed farm in Gran Canaria to prove it can be more cost-effective and scalable than traditional line-based methods. Aiming to produce 300 tonnes of dry biomass per year at a cost of just EUR 100 per tonne, the farm serves as a model for scalable, sustainable aquafarming that can be replicated across Europe.

OCEAN GARDENS

Project name

Ocean Gardens: a scalable and modular approach to open-ocean seaweed aquafarming for sustainable products enabling carbon dioxide removal and marine ecosystem co-benefits

Funded under

European Maritime, Fisheries and Aquaculture Fund (EMFAF)

Coordinated by

Macrocarbon in Spain

Duration

1 October 2025 – 30 September 2028

Find out more

macrocarbon.world/en/ocean-gardens



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Ireland puts the spotlight on regenerative ocean farming

SEAGROW is demonstrating the technical and commercial feasibility of farming that restores ecosystems.

Regenerative ocean farming (ROF) is an innovative approach to aquaculture that has the potential to reduce carbon, enhance marine ecosystems and provide a sustainable source of protein. To unlock this potential, SEAGROW is demonstrating its use as a business model for the large-scale co-cultivation of seaweed and scallops. Having deployed ROF systems in Ireland's Bantry Bay, the project aims to produce 5 000 tonnes of seaweed annually while also substantially reducing pollutants in the bay. If successful, the model could be deployed in the Mediterranean and Black Seas.

SEAGROW

Project name

Seaweed in Ecosystem Enhancing Aquaculture for Growth and Sustainability

Funded under

European Maritime, Fisheries and Aquaculture Fund (EMFAF)

Coordinated by

Óir na Farraige in Ireland

Duration

1 October 2025 – 30 September 2028

Find out more

seagoinggreen.org/seagrow-home-mobile

Uncorking Europe's algae bottlenecks

The ATL.A.HUB project aims to diversify Europe's algae-based products portfolio through knowledge sharing and improved regulation.

Contributing to food security, marine ecosystem health, and carbon sequestration, Europe has high hopes for algae cultivation. But these hopes could be dashed if the significant barriers facing members of the value chain aren't addressed. Enter ATL.A.HUB, a project creating algae networks where stakeholders can share infrastructure, equipment and services within a common-sense regulatory framework. With hubs established at two large algae cultivation and processing facilities in the Canary Islands and Portugal, the approach is accelerating the development of market-ready algae-based products.



© Instituto Tecnológico de Canarias

ATL.A.HUB

Project name

Atlantic Hubs to boost Marine Algae Land-based Aquaculture and Biotechnology

Funded under

European Maritime, Fisheries and Aquaculture Fund (EMFAF)

Coordinated by

Technological Institute of the Canary Islands in Spain

Duration

1 October 2025 – 30 September 2028

Find out more

itccanarias.org/web/en/activity/projects/atl-a-hub

A cool blue future for Baltic communities

COOL BLUE BALTIC combines aquatic food production with the active regeneration of marine ecosystems to boost local economies.

Regenerative ocean farming punches well above its weight. Whether cultivating seaweeds or bivalve molluscs, these species grow without the need for any external inputs such as antibiotics, fertiliser or even feed. As they grow, they sequester carbon, filter out pollutants and serve as habitat for marine life. They're also a sustainable source of protein. COOL BLUE BALTIC is helping local fishers, farmers and coastal communities leverage regenerative aquaculture as a means of diversifying their income and future-proofing their livelihoods.

COOL BLUE BALTIC

Project name

COmmunity Ocean farms and Local Business cLUstErs in the BALTIC sea

Funded under

European Maritime, Fisheries and Aquaculture Fund (EMFAF)

Coordinated by

Submariner Network for Blue Growth EWIV in Germany

Duration

1 October 2023 – 31 December 2025

Find out more

coolbluefuture.org



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Chapter 3

A circular, zero-waste aquaculture economy

From fish effluence to discarded shells and plastic nets, aquaculture produces a substantial amount of waste. Where some see a problem, others see opportunities.

With the promise of a sustainable source of protein with low carbon footprint, the European Commission has put aquaculture at the heart of its European Green Deal. But delivering on this promise requires that the aquaculture sector manages its waste.

For 1 million tonnes of annual produce, the industry produces a significant amount of waste – including nearly 490 000 tonnes of shells. The good news is that this is starting to change, thanks in no small part to EU-funded research and innovation projects, such as the eight highlighted in this chapter.

Wealth hidden in the dirt

Take for example **SAFE**. The project is developing circular economy-based solutions specifically designed to help reduce freshwater aquaculture's environmental impact. One of those solutions involves reusing sludge as a substrate for producing alternative protein sources such as insects and worms.

Another project finding sustainability in sludge is **AQUAPHOENIX**. Using circular economy principles, the project developed a unique way to transform fish waste into nutrient-rich material that can be used to produce renewable energy, fertilisers and feed.

One sector's trash is another sector's treasure

Also working to transform waste into new resources are the **Terraforming LIFE** and **GREENLIFE4SEAS** projects. The former is combining fish waste with livestock manure to create natural fertilisers and biogas, while the latter is turning sediment and shells into secondary raw materials for the building and construction industries.

LIFE REFISH designed a biorefinery capable of converting marine by-products and discards into fish proteins, oils, gelatines and other products that can be used by the food, feed, cosmetic and agriculture sectors.

Aquaculture also creates a substantial amount of plastic waste: the plastic nets and ropes used are often lost at sea or simply thrown away. Projects such as **LIFE MUSCLES** and **BIOGEARS** aim to change that not only by recycling discarded nets, but also by replacing plastic nets and ropes with biodegradable alternatives.

A new farm-to-fork value chain

While these projects focus on what to do with aquaculture waste, **AWARE** helps us to manage our own. The project is embedding aquaponic systems into urban wastewater treatment plants, bringing aquaculture from the sea to the city.

The project aims to create a new farm-to-fork value chain that, when combined with the other solutions highlighted in this chapter, will transform aquaculture into a circular, sustainable and zero-waste industry.



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A fresh approach to freshwater aquaculture

Using circular methods, the SAFE project is diluting aquaculture's environmental impact.

Raising and breeding fish, shrimp and other aquatic animals in freshwater is anything but easy – which is why the number of freshwater aquaculture systems (FWASs) in Europe continues to decline. To reverse this trend, the SAFE project developed several circular economy-based solutions designed to help FWASs become more economically viable while reducing their environmental impact. This includes using effluents and sludge as substrates for producing alternative biomasses such as algae, insects, worms, fungi and aquatic plants. The project is also leveraging AI to help FWASs reduce waste, improve water quality and enhance fish welfare.

SAFE

Project name

SmartAqua4FuturE - SAFE

Funded under

Horizon Europe: Food, Bioeconomy, Natural Resources, Agriculture and Environment

Coordinated by

International Organisation for the Development of Fisheries and Aquaculture in Europe, in Denmark

Duration

1 November 2022 – 31 October 2026

Find out more

projectsafe.eu

A new farm-to-fork value chain for EU aquaculture

Fish farmed in urban wastewater treatment plants could be in the pipeline.

The AWARE project imagines a future where EU cities farm fish in highly efficient systems embedded within their wastewater treatment facilities. These combine aquaculture with hydroponics, using reclaimed water with zero residues to produce fish and vegetables fit for human consumption. Building the EU's first reclaimed water aquaponics system, the project is demonstrating how urban aquaponics can shorten the fish farming value chain, incentivise the reuse of waste resources and bring citizens closer to food production.



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AWARE

Project name

Aquaponics from WAstewater REclamation

Funded under

Horizon Europe: Food, Bioeconomy, Natural Resources, Agriculture and Environment

Coordinated by

INNOVA in Italy

Duration

1 November 2022 – 31 October 2026

Find out more

aware-eu.eu

Sludge: the new hero of sustainable aquaculture

AQUAPHOENIX is demonstrating its circular approach to waste management at seven aquaculture sites in Finland and Norway.

Whether it be fish feed or fish faeces, aquaculture creates a lot of waste, which is often carried into open water, polluting the surrounding marine environment. When pollutant levels become too high, fish farmers are forced to limit or even cease production. To reduce waste released into the environment, AQUAPHOENIX is developing technologies to collect and store it as sludge. This material can be turned into renewable energy, sustainable fertilisers and feed ingredients.

AQUAPHOENIX

Project name

Innovative solutions to reduce AQUAculture emissions and valorize sludge through PHOsphorus and NItrogen eXtraction

Funded under

Horizon Europe: Food, Bioeconomy, Natural Resources, Agriculture and Environment

Coordinated by

NORCE Research in Norway

Duration

1 January 2025 – 31 December 2028

Find out more

aquaphoenix.eu



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Waste not, want not

The Terraforming LIFE project is turning fish sludge and animal manure into bio-fertiliser and biogas for a greener tomorrow.

Fish farming generates significant amounts of effluence through uneaten feed and faeces. The Terraforming LIFE project proposes turning this spoilage into spoils. The project is developing a circular value chain that uses water recycling technology to recover fish sludge from land-based fish farms, also known as recirculated aquaculture systems (RASs). This sludge is then combined with livestock manure using an innovative fermentation process before being transported via a mobile treatment unit to a bio-fertiliser plant. Once digested to produce biogas, the remaining material is a nutrient-rich fertiliser.

LIFE22-ENV-IS-TERRAFORMING LIFE

Project name

From salmon sludge and manure to fertiliser: a circular economy around land-based salmon farming

Funded under

LIFE programme

Coordinated by

First Water in Iceland

Duration

1 June 2023 – 31 May 2028

Find out more

terraforming.is

Building a new life for sediment and shells

GREENLIFE4SEAS develops a process for turning sediment and shells into new building materials.

Every year, the EU generates significant amounts of sediment through dredging operations, and 490 000 tonnes of shells from aquaculture. The GREENLIFE4SEAS project is demonstrating the feasibility, safety and viability of collecting this waste and transforming it into secondary raw materials for the building and construction sector. At the heart of this effort is an innovative mixing technology that can be used on-site, allowing aquafarms to conveniently turn waste into paving blocks, breakwaters and mass stabilisation units.



© Ryzhkov Oleksandr/stock.adobe.com

LIFE22-ENV-IT-LIFE GREENLIFE4SEAS

Project name

GREen ENgineering solutions: a new LIFE for SEdiments And Shells

Funded under

LIFE programme

Coordinated by

Polytechnic University of Bari in Italy

Duration

1 October 2023 – 30 September 2028

Find out more

greenlife4seas.poliba.it

A second chance for mussel nets

Reducing marine plastic starts with recycling plastic mussel socks and replacing them with biodegradable alternatives.

While mussel farming is environmentally friendly, the plastic nets – or socks – in which they are submerged are not. When these socks are replaced, many get lost at sea: in Italy, mussel socks are the third most abundant waste item found on the seafloor. To mitigate this risk, LIFE MUSCLES implemented a mobile recovery and recycling process where plastic mussel socks were collected and converted into new socks. The project also developed a biodegradable sock made of compostable biopolymer to replace the use of polymer-based socks.

LIFE MUSCLES

Project name

Life MUssel Sustainable production (re)cyCLES

Funded under

LIFE programme

Coordinated by

Legambiente National Association in Italy

Duration

1 October 2021 – 31 December 2025

Find out more

lifemuscles.eu



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Turning trash into treasure

A new biorefinery from the LIFE REFISH project converts discarded fish and waste into value-added raw materials.

Whether caught or cultivated, fish and seafood leave a mass of discarded fish and by-products in their wake. Where others see waste, LIFE REFISH saw an opportunity to make high value-added products. The project designed and demonstrated a biorefinery capable of processing an average of 300 kg of raw materials per hour. Over the course of the project, more than 45 tonnes of marine by-products and discards were processed. This material was converted into fish proteins, oils, gelatines, collagen, chitosan and mineral fractions – all of which can be used by the food, feed, cosmetic and agriculture sectors.

LIFE21-ENV-ES-LIFE REFISH

Project name

Flexible biorefinery to valorise discards and by-products of the European fish and seafood production

Funded under

LIFE programme

Coordinated by

Jealsa Foods in Spain

Duration

1 September 2022 – 31 August 2025

Find out more

liferefish.com

A bio-based alternative to a knotty problem

Biodegradable ropes from the BIOGEARS project aim to reduce aquaculture's environmental footprint.

Cultivating seaweed and mussels involves a lot of rope. These are usually made from petroleum-based plastics which are cheap and resilient – but also pollute the environment. BIOGEARS has a better idea. The BIOGEARS consortium developed bio-based ropes that offer a better mussels yield and a reduced environmental footprint while having the same durability as their plastic counterparts. Trialled in the Atlantic basin, the ropes are now market-ready, with project partners in contact with industrial partners to scale up the production and commercialisation of the BIOGEARS ropes.



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BIOGEARS

Project name

Biobased gears as solutions for the creation of an eco-friendly offshore aquaculture sector, in a multitrophic approach, and new biobased value chains

Funded under

European Maritime and Fisheries Fund (EMFF)

Coordinated by

AZTI Foundation in Spain

Duration

1 November 2019 – 30 April 2023

Find out more

biogears.eu

Chapter 4

Supporting aquaculture transition

The projects in this chapter focus on providing aquaculture with the skills, coordination and climate adaptation tools it needs to achieve a climate-neutral future.

In the previous chapters we saw how EU-funded research initiatives are creating innovative solutions for a more productive and sustainable aquaculture sector. But a competitive, resilient and climate-neutral European aquaculture will also require skills, coordination and climate adaptation.

Projects supported by Horizon, EMFAF and LIFE are delivering on this goal.

Planning for the future

Take **OCCAM**, a project dedicated to providing simple, scalable solutions for mitigating aquaculture's environmental impact. These solutions cover everything from guidelines for assessing CO_2 emissions to species-specific production methods.

While OCCAM focuses on mitigation, **ActFast** looks at climate adaptation. The project is developing a portfolio of data-driven solutions – including AI monitoring tools – that Europe's aquaculture-focused regions can use to future-proof the industry against a changing climate.

Coordination is key

Achieving climate neutrality won't happen in a vacuum. It also demands coordination, both across the aquaculture value chain and with other related sectors.

The **EU Aquaculture Assistance Mechanism** is designed as a one-stop shop for the sector, providing an array of support and learning opportunities that Member States, industry and other stakeholders can use in developing a more sustainable aquaculture sector in the EU.

Supporting coordination with other sectors is **AquaWind**, a project that looks to pair fish farming with floating wind farms. By sharing resources, the multi-use project aims to deliver a wide range of economic, environmental and social benefits to the aquaculture sector and beyond.

Training the next generation

A resilient aquaculture sector also needs a skilled workforce. That's why **BlueAquaEdu** is providing skills and education for future aquaculture professionals.

With the goal of inspiring students to pursue a career in the sector, the project developed a series of interactive games that both introduce players to fish farming, as well as provide training on specific, sustainability-related skills.

By providing tools to help the sector adapt to climate change, coordinate with other actors and secure a skilled workforce, the EU is strengthening the sustainability and long-term viability of Europe's aquaculture sector.

Simple solutions to shave aquaculture's climate impact

OCCAM is developing innovative, science-based solutions to help aquaculture adapt to and mitigate climate change.

Reducing aquaculture's carbon emissions is a complex problem, but the solutions might be simple. That's the thinking behind OCCAM, a project working to develop simple yet scalable solutions capable of mitigating aquaculture's environmental impact. While some of these will have broad applicability, such as guidelines for self-assessment of CO_2 emissions and sustainability reporting requirements, others will focus on production methods for specific species such as carp, rainbow trout and salmon. Together, these solutions will create a resilient, sustainable and climate-smart future for European aquaculture.

OCCAM

Project name

Operationalizing Climate Change Adaptation and Mitigation for aquaculture

Funded under

Horizon Europe: Food, Bioeconomy, Natural Resources, Agriculture and Environment

Coordinated by

Nofima in Norway

Duration

1 May 2025 – 30 April 2029

Find out more

occamproject.eu



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Climate-smart solutions for climate-resilient aquaculture

ActFast delivers the tools to future-proof aquaculture-rich regions against a changing environment.

From rising temperatures to ocean acidification, climate change poses a significant risk to Europe's aquaculture-focused regions. To help these regions better understand and mitigate this risk, the ActFast project is mapping climate hazards and using this data to develop a portfolio of climate-smart solutions. These include an early warning system, climate-resilient aquafeeds and species-specific AI monitoring tools, as well as tools for addressing invasive species and disease. Put them together and these solutions provide a much-needed boost to those struggling to adapt to the realities of climate change.

ActFast

Project name

Actions for Climate Transition by developing Future Aquaculture Strategies and Technologies

Funded under

Horizon Europe: Food, Bioeconomy, Natural Resources, Agriculture and Environment

Coordinated by

University of Bologna in Italy

Duration

1 June 2025 – 31 May 2029

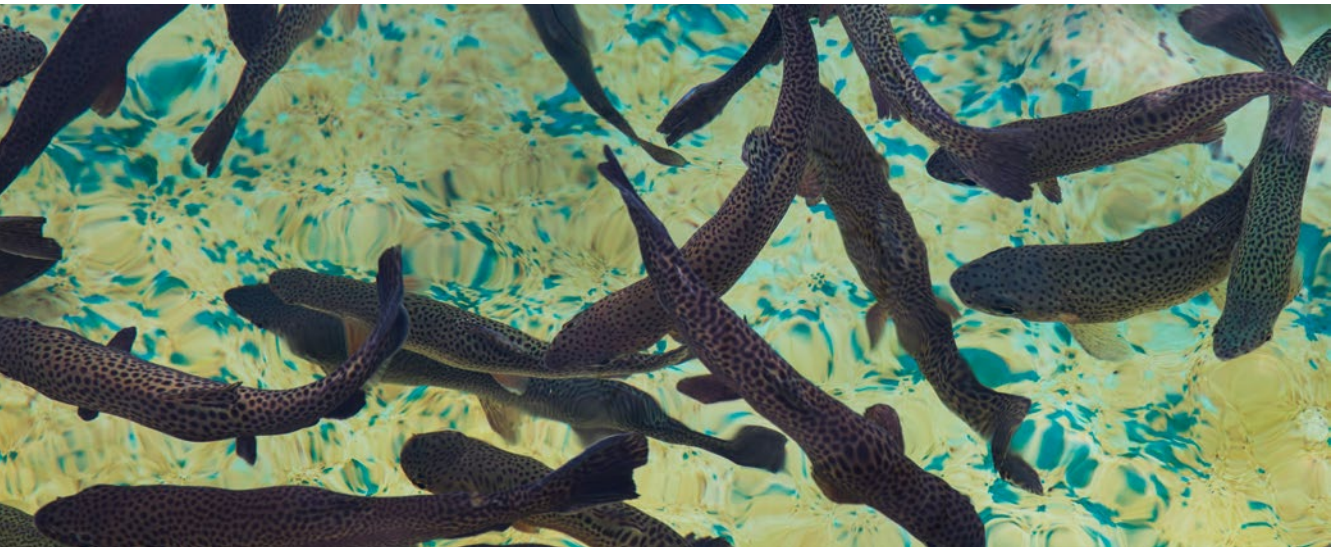
Find out more

actfast-project.eu

A support hub for sustainability and success

The EU Aquaculture Assistance Mechanism provides resources for implementing a more sustainable and competitive EU industry.

The EU Aquaculture Assistance Mechanism is designed to support Member States, industry and other relevant stakeholders in developing a more sustainable and competitive aquaculture sector. Positioned as a one-stop shop for information on sustainable aquaculture – from knowledge sharing and best practices to technical expertise, e-learning, training and workshops – the mechanism provides users with the logistical, technical and administrative support they need to implement the EU's strategic guidelines on sustainable aquaculture. In doing so, it plays a vital role in ensuring the future success and sustainability of the EU aquaculture sector.



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EU Aquaculture Assistance Mechanism

Project name

EU Aquaculture Assistance Mechanism

Funded under

European Maritime, Fisheries and Aquaculture Fund (EMFAF)

Coordinated by

NTT DATA in Belgium

Duration

June 2022 – April 2028

Find out more

aquaculture.ec.europa.eu

One ocean platform, multiple uses

For the first time, marine energy production is joined with live fish aquaculture in the Atlantic region.

According to AquaWind, more can be accomplished when resources are shared. That's why it proposed joining a floating wind farm with an innovative, multi-species fish farm. To achieve such a pairing, the project developed an innovative finfish aquaculture prototype that includes a tailor-made fish cage with novel net materials, a high level of digitalisation to enable remote operation, and species diversification. By demonstrating the economic, environmental and social sustainability of its model, the project has provided a roadmap towards the real-world implementation of multi-use projects.

AquaWind

Project name

Innovative multi-use prototype combining offshore renewable energy and aquaculture in the Atlantic Basin

Funded under

European Maritime, Fisheries and Aquaculture Fund (EMFAF)

Coordinated by

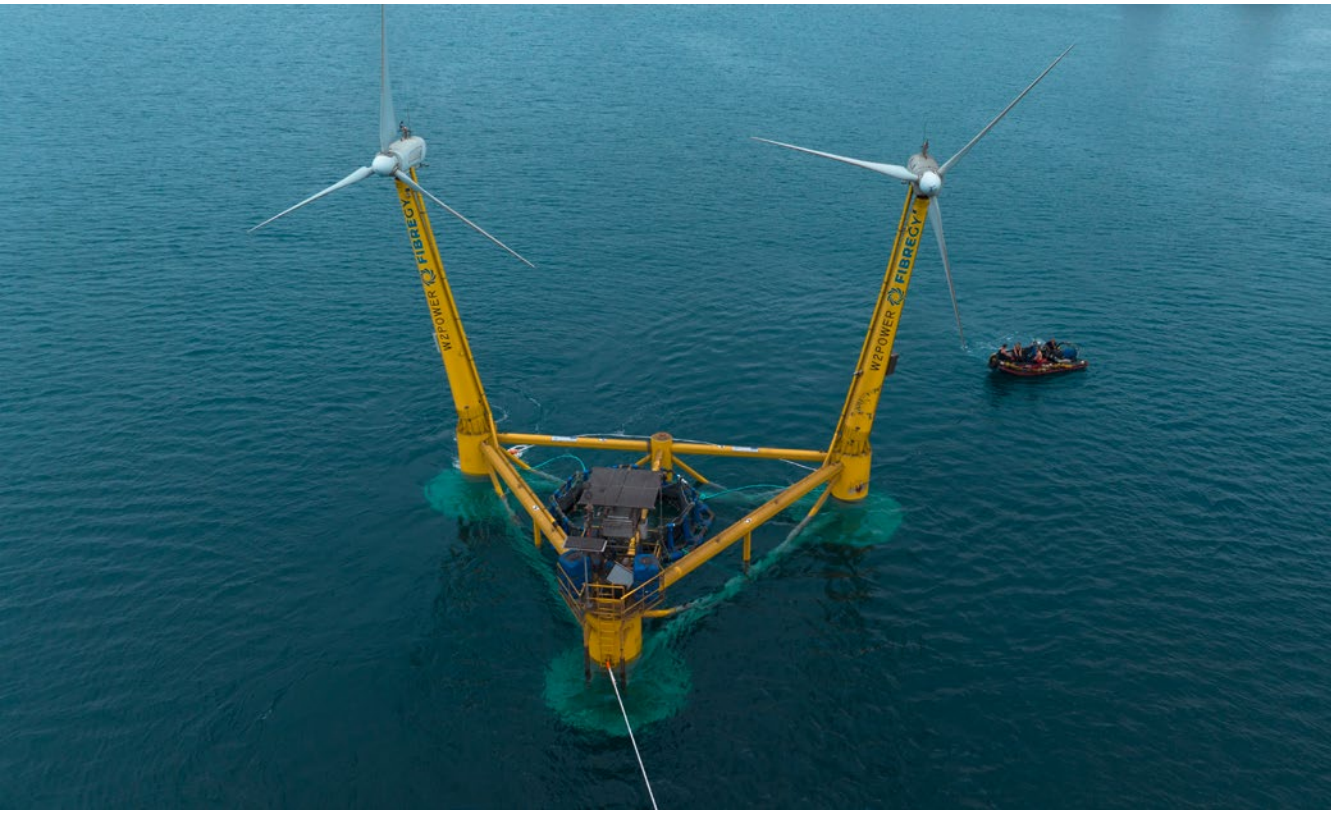
Government of the Canary Islands in Spain

Duration

1 September 2022 – 31 May 2026

Find out more

aquawind.eu



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A playful way to attract new talent

What better way to get students excited about aquaculture than to make a game of it?

Future-proofing Europe's aquaculture sector requires inspiring the next generation of workers today and developing their blue skills. Knowing that it's never too early to start, BlueAquaEdu is using games to introduce the sector to teenagers and university students. The project's interactive games are designed not only to motivate users to pursue a career in aquaculture, but also to show them how to use cages and recirculating aquaculture system technologies. Other games focus on specific fish species or such sustainability-related issues as post-harvesting value chains and the valorisation of by-products. In addition to the games, the project is working to match students with experienced mentors.

BlueAquaEdu

Project name

Blue Career Centre for Aquaculture Education supported by a gamification approach and distance learning platform

Funded under

European Maritime, Fisheries and Aquaculture Fund (EMFAF)

Coordinated by

Agricultural University of Athens in Greece

Duration

1 September 2023 – 28 February 2026

Find out more

blueaquaedu.eu

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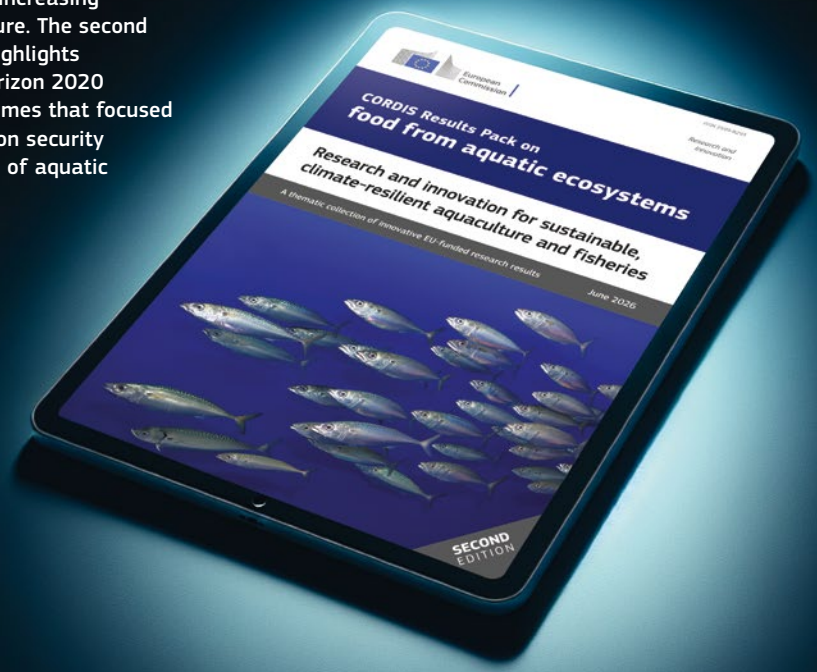
RESULTS PACK ON FOOD FROM AQUATIC ECOSYSTEMS – SECOND EDITION

As our global population continues to grow, so does the demand for aquatic food, placing increasing pressure upon fisheries and aquaculture. The second edition of this CORDIS Results Pack highlights 15 projects funded under the EU's Horizon 2020 and Horizon Europe research programmes that focused on improving aquatic food and nutrition security while contributing to the preservation of aquatic ecosystem integrity.



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