European Commission

Algae innovation

Sustainable alternatives emerging from European seas and waters

Responding to global challenges including climate change and ecosystem degradation, Europe is set to transition to a sustainable, circular and carbon-neutral economy. Algae offer a sustainable means to deliver an almost endless number of valuable products, including food, animal feed, nutritional supplements, pharmaceuticals, cosmetics, plastics, fertilisers, biofuels and more.

Research and investment, including the Horizon Europe programme, play a crucial role in delivering the innovations necessary to advance the production and valorisation of algae. The CORDIS Results Pack on algae innovation highlights 11 innovative EU-funded projects that showcase the potential and versatility of algae production and conversion. The projects cover fundamental insights into the role of algae in the carbon cycle, the development of new and improved algae production systems, the use of algae in bioremediation, and the delivery of products such as animal feed, pharmaceuticals, cosmetics, yoghurt pots and more.

To access the full Pack please go to: cordis.europa.eu/article/id/449950

Research and Innovation

ALEHOOP

(Biorefineries for the valorisation of macroalgal residual biomass and legume processing by-products to obtain new protein value chains for high-value food and feed applications), coordinated by Contactica in Spain

An increasing population and a growing middle class have caused demand for protein to skyrocket. To meet current demand, Europe is already importing over 30 million tonnes of soya – a key source of protein – from the Americas every year, the majority of which is used to feed livestock. Pilot-scale biorefineries developed by the EU and industry-funded ALEHOOP project have successfully demonstrated the feasibility of algae-based protein, offering a sustainable, domestic alternative to imported soya.

→ alehoop.eu

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AlgaeCeuticals

(Development of microalgae-based natural UV Sunscreens and Proteins as cosmeceuticals and nutraceuticals), coordinated by the Centre for Research and Technology Hellas in Greece

Microalgae are an untapped source of valuable pharmaceutical and cosmetic compounds – and could help to feed a growing population. The AlgaeCeuticals project sought to identify and promote promising cultivation methods that could enable industry to more fully exploit the potential of microalgae. The project achieved a number of breakthroughs, including a method for large-scale production, and a better understanding of how to grow and extract mycosporine-like amino acids to produce natural UV sunscreens.

→ algaeceuticals.gr

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ASPIRE

(Accelerated Seaweed Production for Innovative and Robust seaweed aquaculture in Europe), coordinated by the University of Galway in Ireland

Dulse is a leafy red seaweed that grows on the Atlantic coast, and has been eaten by Europeans for thousands of years. Its high protein content and enjoyable taste make it an attractive crop for the aquaculture industry, but cultivation efforts have so far been met with only modest success. By exploring new strains and cultivation practices, the EU-funded ASPIRE project aims to deliver a sustainable, high-yield and quality seaweed for Europe.

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Biosolar Leaf

(Disrupting the food ingredient and protein markets: a breakthrough technology for large-scale microalgae cultivation), coordinated by Arborea in Portugal

The EU needs sustainable, carbon-neutral solutions for producing food within Europe, reducing its dependency on foreign imports while supporting its Green Deal objectives. The EU-funded Biosolar Leaf project is developing an innovative solution for producing food ingredients from microalgae at scale, using a soil-free system that can be sited on any surface, even barren land and rooftops. The project host is now building its first commercial facility for mass-producing protein and other functional ingredients out of microalgae.

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Cyanobacteria

(Developing an organic fertilizer production system using nitrogen fixing Cyanobacteria), coordinated by Go Green FoodTech in Israel

Fertilisers present a barrier to more sustainable agriculture and European food security. Significant amounts of energy are required to produce ammonia fertilisers, typically provided by climate-damaging fossil fuels. The EU-funded Cyanobacteria project's circular biotechnology – integrated into their AlgaeNite management system – produces high-quality, clean, liquid biofertiliser, maintaining crop yields with zero emissions. Since the project's completion, the project host has pivoted to a solution that offers greenhouses standalone bioreactors for growing plant protein in self-contained and automatically managed reactors.

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e-shape

(EuroGEO Showcases: Applications Powered by Europe), coordinated by ARMINES in France

Since 2011, massive landings of sargassum have been reported in the Caribbean. The algae can make marine navigation difficult, foul offshore turbines and contaminate pristine environments with rotting vegetation. The EU-funded e-shape project uses high-resolution Earth observation data to provide a 5-day forecast of approaching algae rafts. This gives local authorities the means to protect coastal environments from encroaching algae, and helps businesses plan their recovery and valorisation as fertiliser, biomaterials, cosmetics and animal feed.

→ e-shape.eu

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FLEXI-GREEN FUELS

(Flexible and resilient integrated biofuel processes for competitive production of green renewable jet and shipping fuels), coordinated by Bremerhaven University of Applied Sciences in Germany

Advanced biofuels are generally derived from non-food-based feedstocks, and can deliver significant life-cycle reductions in greenhouse gas emissions. The investigation into new feedstocks includes work on the commercial and technical viability of microalgae. Using a type of microalgae that grows on sugar as well as sunlight, the EU-funded FLEXI-GREEN FUELS project was able to turn woody waste recovered from Norway spruce and silver birch cultivation into sustainable biofuel for shipping and aviation – with a stream of nutraceuticals as a side benefit.

→ flexigreenfuels.eu

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MARINEGLYCAN

(Marine chemical glycobiology: a molecular understanding of the carbon cycle and bioactive sulfated marine glycans), coordinated by the Max Planck Society for the Advancement of Science in Germany

The ocean harbours a vast reservoir of dissolved organic carbon, much of which is composed of glycans – sugar-based molecules created by photosynthetic organisms. These glycans are highly diverse molecules, and emerging evidence suggests some types of glycans can sequester carbon for hundreds of years. Developing a set of biochemical tools to study how algal glycans and microbial proteins interact at the molecular level, the transdisciplinary EU-funded MARINEGLYCAN project is advancing our knowledge of the global marine carbon cycle.

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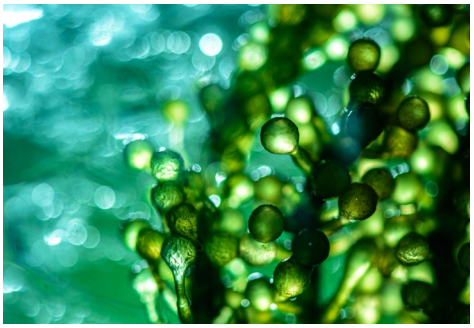
MULTI-STR3AM

(A sustainable multi-strain, multi-method, multi-product microalgae biorefinery integrating industrial side streams to create high-value products for food, feed and fragrance), coordinated by A4F-Algafuel in Portugal

Existing agricultural and manufacturing systems carry negative environmental and ecological impacts such as pollution, habitat destruction and emissions from fossil fuel burning. Algae present an environmentally friendly solution, with a wide range of potential uses as a fuel, food source and material for manufacturing. The EU and industry-funded MULTI-STR3AM project converted an abandoned industrial site into an algae factory that can deliver sustainable high-value products for a range of industries.

→ multi-str3am.com/en



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NENU2PHAR

(For a sustainable and European value chain of PHA-based materials for high-volume consumer products), coordinated by the French Alternative Energies and Atomic Energy Commission in France

Plastics are indispensable in high-volume manufacturing of consumer products and packaging. Yet most of these plastics are produced using fossil fuels, can be hard to recycle and can lead to environmental hazards such as microplastic pollution. Offering an alternative to fossil fuel-based plastics, the EU and industry-funded NENU2PHAR project has developed biodegradable packaging derived from microalgae, in a new bioplastic value chain.

→ nenu2phar.eu

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WWTBP-by-Microalgae

(A circular economy platform for treatment of wastewater by blue green microalgae), coordinated by Ghent University in Belgium

Using a novel two-step treatment process, the EU-funded Waste Water To Blue Pigment-by-Microalgae project is advancing our capacity to use microalgae such as *Spirulina* to clean wastewater, generating alternative fuels and high-value compounds in the process. The project focused on optimising growth conditions for the microalgae, identifying strains that can thrive during Europe's cold winters, while enhancing the pollutant absorption and phycocyanin production of these algae.

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