EXECUTIVE SUMMARY

The first nature based Seawater Aquaponics solution in the Iberian Peninsula to grow Greater Amberjack, a highly valued fishery resource, together with macroalgae, namely sea lettuce and nori seaweed, in a new Integrated Multi Trophic Aquaculture (IMTA) circular technology, with a positive water and carbon footprint.

2022

AMBERSEA is merging, in a single project and team, the know-how, innovation and technologies developed by two companies: **Aquaponics Iberia**, based in Portugal, and **Gloasis GmbH**, based in Germany.

One of the 6 potential game-changers for EU aquaculture!

300 tons/year

940 tons/year

Nutritious superfoof with high content of protein, fiber, vitamin B12, magnesium, iron and iodine.

19.5 million L/year

+ FRESHWATER

1,300 tons/year

+ CO_2 CAPTURE

+ ORGANIC COMPOST

200 tons/year

+ COOLING ENERGY

Aquaponics Iberia is an aquaponics and Recirculating Aquaculture System (RAS) provider and expert company focused on sustainable and productive aquaculture land-based units, using its own design, engineering and water treatment developed technologies to efficiently and sustainably grow food, taking advantage of the symbiotic ecosystems combining finfish and crop (or algae) farming.

Gloasis GmbH are specialists in engineering, aquaculture, aquaponics, water treatment, air conditioning, fish waste processing, aquaculture automation, renewable energies cogeneration of electricity and seawater desalination.

We are **recognized as an R&D entity by ANI**, in the technical-scientific domains:

- **Agri-food** – Healthy and sustainable food
- **Water and Environment** – Waste reduction, management, treatment and recovery
- **Agri-food** – Waste treatment and reuse

ANI AGÊNCIA NACIONAL DE INOVAÇÃO

AMBERSEA

EXECUTIVE SUMMARY

Combining nature with technology to bring you the most pure, delicious and sustainable seafood

The context we intend to solve (EU food system and its market)

The EU annually imports around **55 billion € worth of seafood**. These **imports represent 2/3** of the EU's domestic seafood consumption, showing a clear deficit of the EU fisheries balance of trade. EU's **seafood per capita consumption** is high in most countries (averaging 25 kg/year; 61 kg/year in Portugal). Wild-catch fisheries are stagnated because most stocks are fully exploited. Contaminants in seafood (heavy metals, microplastics, medication...) are also a current concern. A more sustainable and productive seafood production system is required, which may enable increasing its regional resilience.

The global **macroalgae market** has enormous growth potential (currently around **11 billion €** and **18.3 billion €** by 2028) to supply the food and animal feed industries, pharmaceutical and cosmetics industries. Most of this market is still being unsustainably supported by wild harvesting of not quality-controlled algae (98% of total seaweed). This exploration method will inevitably stagnate or end in the short term, requiring the development of controlled environment and sustainable techniques to increase its internal supply capacity. Especially pharmaceutical industry requires constant quality-controlled raw materials.

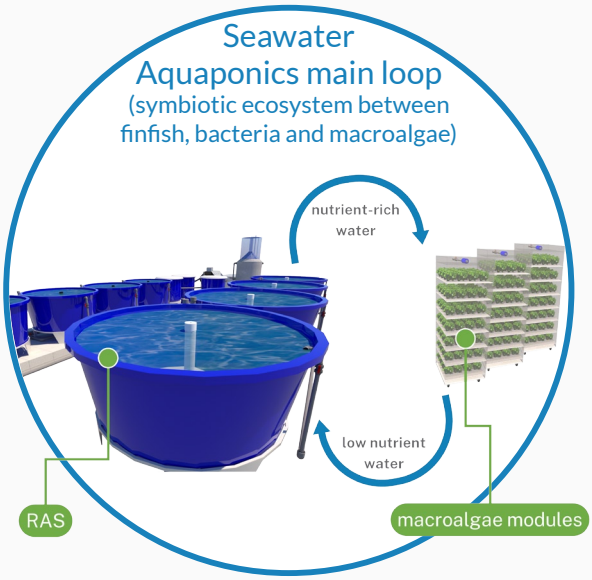
Agriculture worldwide consumes and wastes 70% of potable **freshwater** and still uses many pesticides and synthetic fertilizers, harmful to biodiversity, the environment and consumer health.

Food travels a lot around the planet, increasing **CO_2**-emissions, losing freshness, increasing food waste and contributing to decreasing local food self-sufficiency.

Aquaponics and Integrated Multi Trophic Aquaculture Systems are promising technologies to overcome all of this if locally, efficiently and sustainably implemented.

Our technology (value proposition)

Aquaponics Iberia has developed a dual-loop aquaculture system, with aerobic biodigesters. The extra loop removes all the solid waste from the main loop and processes it aerobically, converting it into natural liquid fertilizer and delivering it back to the main loop, through automation according to conductivity readings being monitored in the water. This increases the overall productivity of plants/algae and increases food safety, by increasing dissolved oxygen, turning all the system much more aerobic, reducing pathogens and increasing plants and fish metabolism/growth. Additionally, it saves even more water (+20%) than common aquaponics systems and substantially reduces maintenance interventions (-50%), downtimes and production costs. These modular production systems and technologies allow to grow and provide local, fresher, and more sustainable food in urban areas.

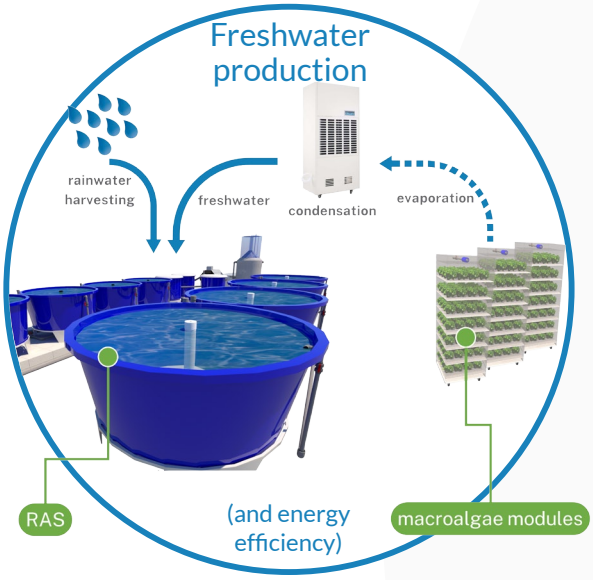


Gloasis has developed a highly productive vertical modular macroalgae system, which gets the input of CO_2-rich air from the Recirculating Aquaculture System (RAS) unit (fish and bacteria), speeding up the growth of macroalgae and CO_2 capture.

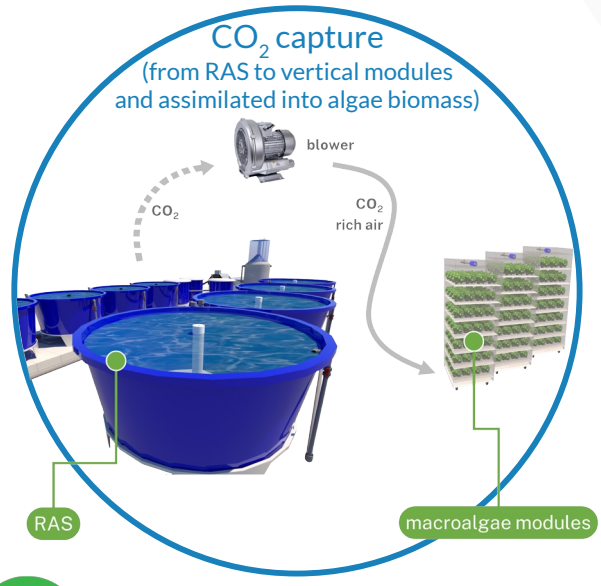
AMBERSEA

EXECUTIVE SUMMARY

SEAWATER SUSTAINABLE SEAFOOD FACTORIES



AMBERSEA offers cost reductions due to aeration energy savings. Instead of energy-intensively pushing air into the water, where the air bubbles rapidly leave the water, the vertical algae modules provide low-energy aeration by applying forced draft waterfall aerators. We convert the consequent high evaporation rate into an advantage by recycling the heat losses from evaporation into the water as condensation heat. Most of the evaporated water through these vertical modules gets recovered through a Sorption-Condensation-Process, which allows for controlled low-energy heating of the seawater to provide optimum growth conditions for the selected species and co-produce freshwater. This freshwater can be used as irrigation water for nearby agriculture, turning unproductive barren land into fertile and fruitful properties, with water availability.



AMBERSEA

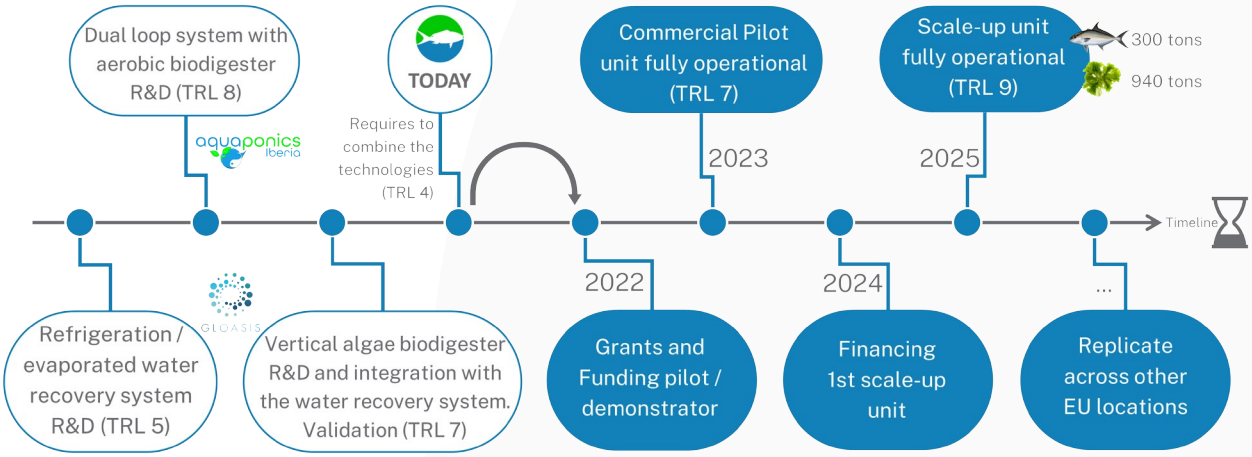
This allows a positive water footprint and carbon sequestration to be incorporated into algae biomass.
Additionally, the solar panels are cooled by seawater that is periodically pumped into the production system (for osmoregulation purposes), increasing energy efficiency and passively heating this incoming water.
AMBERSEA project uses all these technologies, integrating the dual loop system, the vertical algae modules and the desalination process, turning this solution very innovative, disruptive, highly productive, cost-efficient and sustainable.
With our technologies and innovations, we efficiently cover all the previously described issues of the food system and efficiently grow delicious fresh seafood together with macroalgae, dramatically saving/producing water (freshwater), by recycling all the water and having no effluents, by monitoring, controlling and absence of contaminants in food due to a controlled environment, by being close to consumers, in coastal high-density population areas, by sequestrating and saving carbon emissions (through algae, all CO_2 generated by fish and bacteria gets assimilated) and by not using pesticides, medication nor synthetic fertilizers.

The products

AMBERSEA project is a seawater aquaponics solution designed to grow **300 tons/year** of the high-priced finfish **Greater Amberjack** (*Seriola dumerili*) together with **940 tons/year of sea lettuce** (*Ulva sp.*) and **nori seaweed** (*Porphyra sp.*). It uses a set of innovations and technologies previously briefly described, which turn this **IMTA circular technology** more productive, cost-efficient and sustainable, **producing freshwater** and **capturing CO_2**.
The production techniques allow growing seafood (finfish and seaweed) in a controlled environment free of medication, contaminants (heavy metals, microplastics, parasites and pathogens), pesticides, synthetic fertilizers or additives. When compared to conventionally farmed G. Amberjack, **AMBERSEA** fish benefits from a controlled environment and ideal parameters, very low mortality (3 to 4% compared to 15% in cage farming), no parasites, better health and welfare, much faster and isometric growth and better quality (protein, EPA and DHA and lipid content).
ASC (Aquaculture Stewardship Council) and Friend of the Sea certifications should immediately and easily be implemented, creating value, validating sustainable and responsible aquaculture and conveying trust to the company's target market and customers.
The implementation of the Emissions Trading System will potentially allow us to sell carbon credits and obtain additional revenues of more than 65 k€/year, while saving around **1,300 tons of CO_2** emissions.

EXECUTIVE SUMMARY

THE PATH TO A SUSTAINABLE AND CIRCULAR SEAFOOD SYSTEM



Our Market

Fresh Greater Amberjack has currently a B2B market price of 11€/kg, in Europe. Organic seaweed produced by **AMBERSEA**, through an innovative technology, will be sold at an average B2B price of 10€/kg.

We prioritize local markets near the production units in Southern Europe. Central and Western Europe are further peer markets for fish and algae products, with increasing demand for premium food products.

Regarding seafood, we focus on a selection of restaurants and hotels and specific retailers (demanding certified seafood), considering the preferred market segment for this species, being high-valued and usually sought after by Japanese, Sushi, and hotel restaurants.

Ulva and Nori are nutritious superfoods, sources of bioactive metabolites and ingredients for animal feed, pharmaceuticals, cosmetics and nutraceutical industries, being also our target markets as we supply certified and stable quality. Restaurants and food retail are becoming a trendy and growing option for macroalgae.

Location of the seawater sustainable seafood factory

The production unit should be located close to the sea, on the southern Portuguese or Spanish coast, benefiting from good water quality and temperate temperature, as well as sunlight for algae growth and photovoltaic energy.

The production system requires a total surface area of 1.85 hectares, comprising a warehouse where the aquaculture equipment will be located, together with storage and logistics operations, connected to a greenhouse, where the vertical macroalgae modules will be located. Water should be pumped directly from the ocean. It requires intermittent pumping for osmoregulation purposes. Like in desalination plants, the higher saline water gets diluted with seawater before rejection, to avoid environmental impact.

Roadmap - the pilot

After R&D and validation of technologies have been completed in the past, we are currently raising funding for a small-scale pilot demonstrator unit, being productive and small-scale commercial. This pilot unit will validate production capacity, considering the integration of the different new technologies, and allow to fine-tune and improve some processes, as well as train the future team members when scaling up.

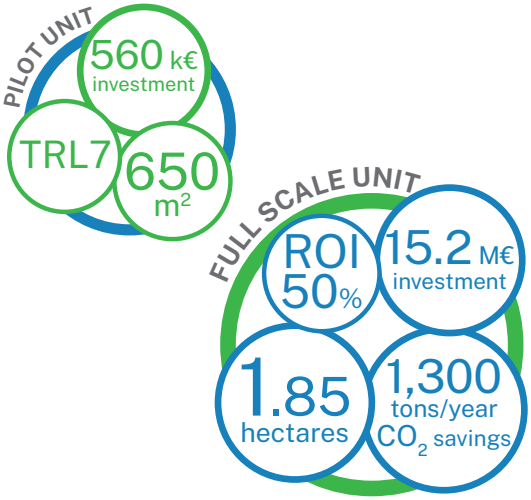
This pilot unit requires a total surface area of 650 m², comprising a warehouse where the aquaculture equipment will

		DEMONSTRATOR	SERIES A (1 FULL SCALE UNIT)	SCALE UP (5 UNITS)
	Size	650 m²	1.85 hectares	5 x 1.85 hectares
	CAPEX	539 000 €	14 500 000 €	72 500 000 €
	OPEX Year #1	132 511 €	2 115 514 €	10 222 800 €
	FINANCING DEMAND	560 000 €	15 200 000 €	76 000 000 €
	Revenues per Year *	283 802 €	14 736 859 €	73 684 295 €
	Net Profit per Year *	24 909 €	7 288 700 €	36 768 025 €
	Net Profit on Sales *	9%	49%	50%
	ROI *	5%	50%	51%
	Payback period	6 years	2 years	2 years
	FTE	3	31	150
ANNUAL PRODUCTION	Fresh finfish	6 tons	300 tons	1 500 tons
ANNUAL PRODUCTION	Organic fresh seaweed	19 tons	940 tons	4 700 tons
ANNUAL PRODUCTION	Volume of water recovery	180 000 liter	15 000 000 liter	75 000 000 liter
ANNUAL PRODUCTION	CO_2 emissions reduction	28 tons	1 400 tons	6 900 tons

* Considering revenues only from finfish and seaweed.
5-year annual average from the 2nd year onwards.

AMBERSEA

EXECUTIVE SUMMARY



be located, together with storage and logistics operations, connected to a greenhouse, where the vertical macroalgae modules will be located. We already have land and two possible locations for this pilot unit, on the Portuguese Western coast, with easy access to seawater. One of the locations is in the Port of Peniche with direct connection to ocean seawater and very close to fish processing and conservation industries. **The pilot requires less than 600 k€ investment** (already considering working capital), reaching 260 k€ revenues in the second year just from seafood and algae. It will grow 6 tons/year of finfish together with 19 tons of macroalgae. After being fully operational and validating the production system, we should move to raise funding for the scale-up unit (1.85 hectares), implement it, turn it operational and profitable and later replicate it in other regions.

Investment and Return

Currently, we are raising funding to implement the pilot/demonstrator unit, which, due to its small scale, should not be considered an isolated investment, but an important step to make technically viable the investment in larger-scale production units (human resources and technology). Per se, the investment in the pilot unit is expected to be recovered in 6 years and will have an average expected ROI of 5% per year (only considering revenues from food sales).

The first larger-scale production unit, which is the main **investment** and relevant stage to reach profitability, will require an estimated amount of **15.2 M€**. Expected revenues for the second year are 13.3 M€, with a **payback period of 2 to 3 years**, an average EBITDA-To-Sales Ratio of 73%, an average Net Profit on Sales of 49%, and an average **ROI of 50%**.

We are now ready to move to the next stage, which is to build the pilot/demonstrator unit and make it productive and sustainable.

Are you interested in this investment and joining us in this great project? Get in touch and ask us for the detailed business plan!

ambersea@aquaponicsiberia.com | www.aquaponicsiberia.com/project/ambersea

AMBERSEA