

BEST PRACTICES ON THE PRODUCTION AND SUSTAINABILITY OF MICROALGAE IN EUROPE WORKSHOP

Improving sustainability in microalgae production

Mariana Carneiro
Innovation manager at

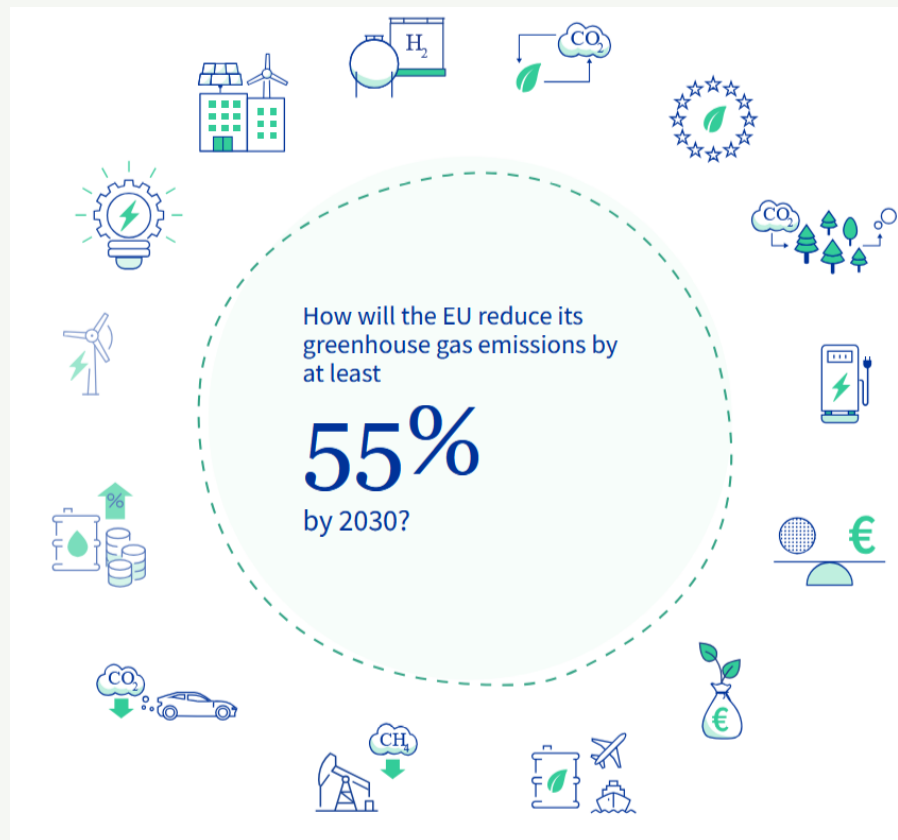
necton

October 22nd, 2024



Introduction

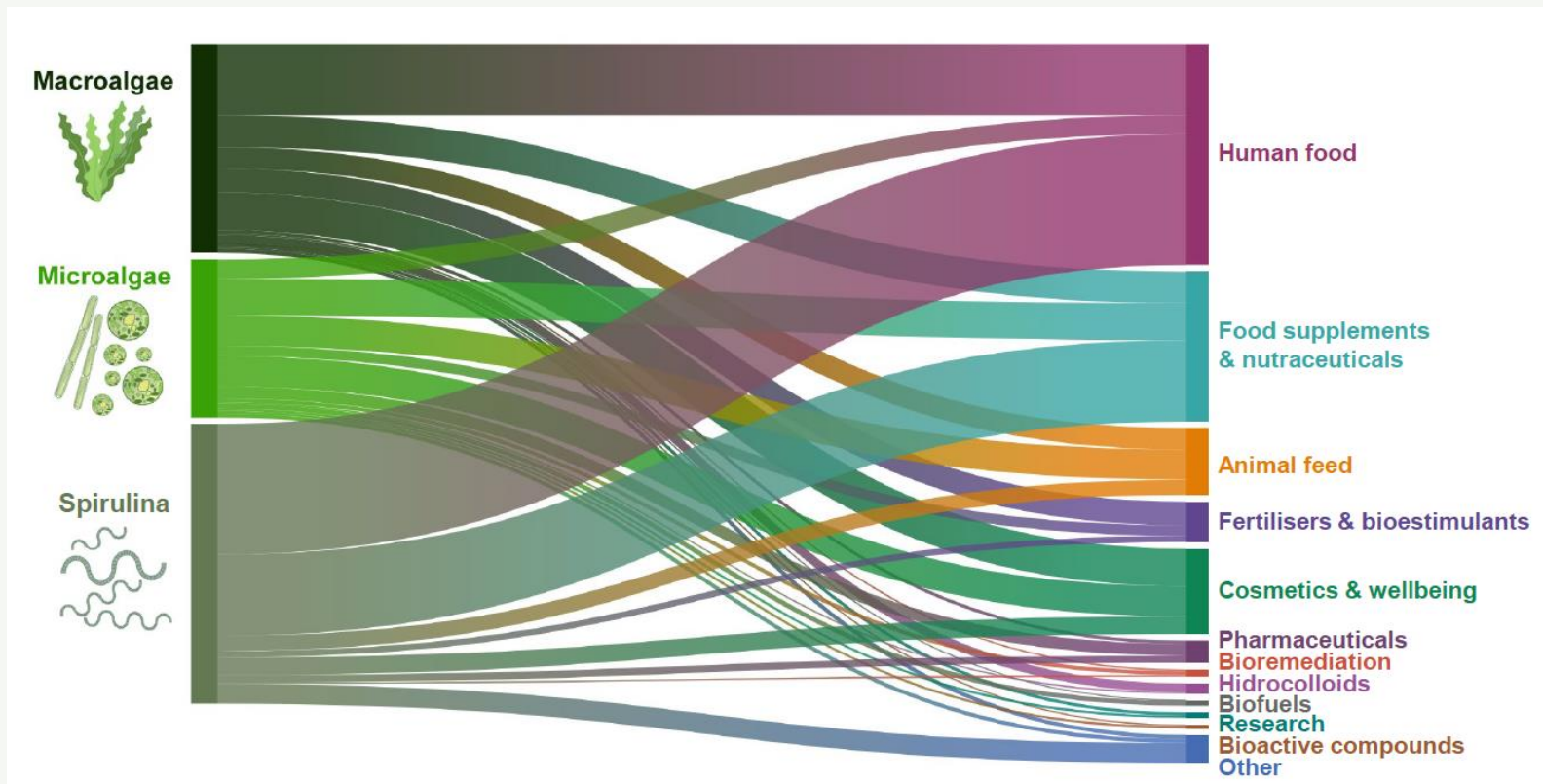
The EU's Circular Economy Action Plan, part of the Green Deal, sets the tone for greener solutions



<https://www.consilium.europa.eu/en/policies/green-deal/fit-for-55/#0>

Introduction

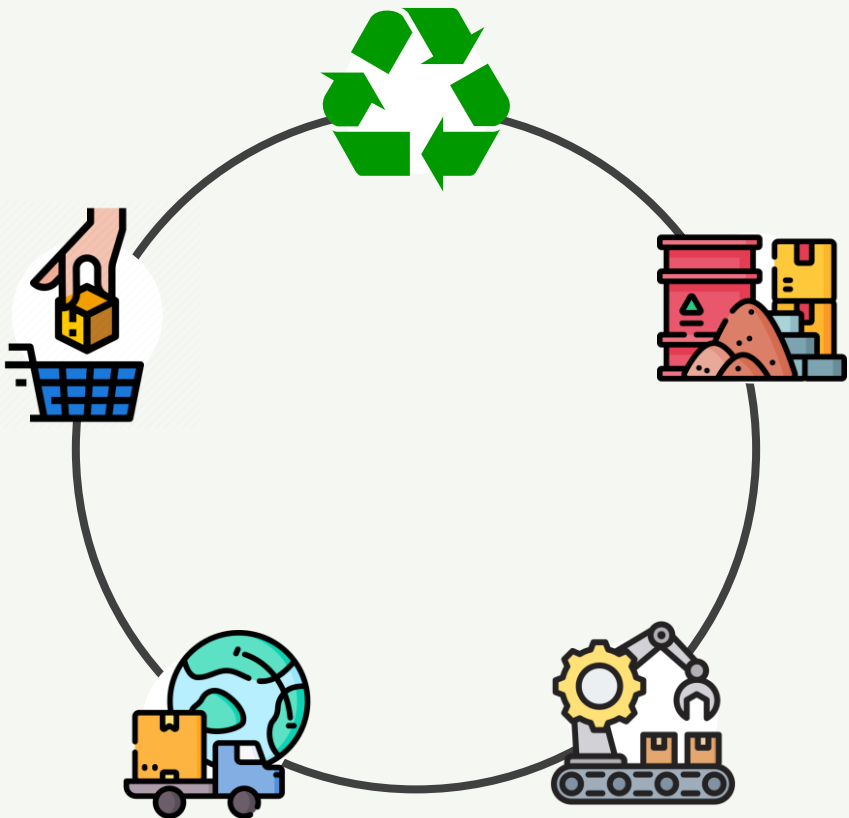
Growing demand for microalgal biomass and its derivatives.



2022; DOI: [10.2760/813113](https://doi.org/10.2760/813113)

Introduction

The importance of tools for sustainability assessment

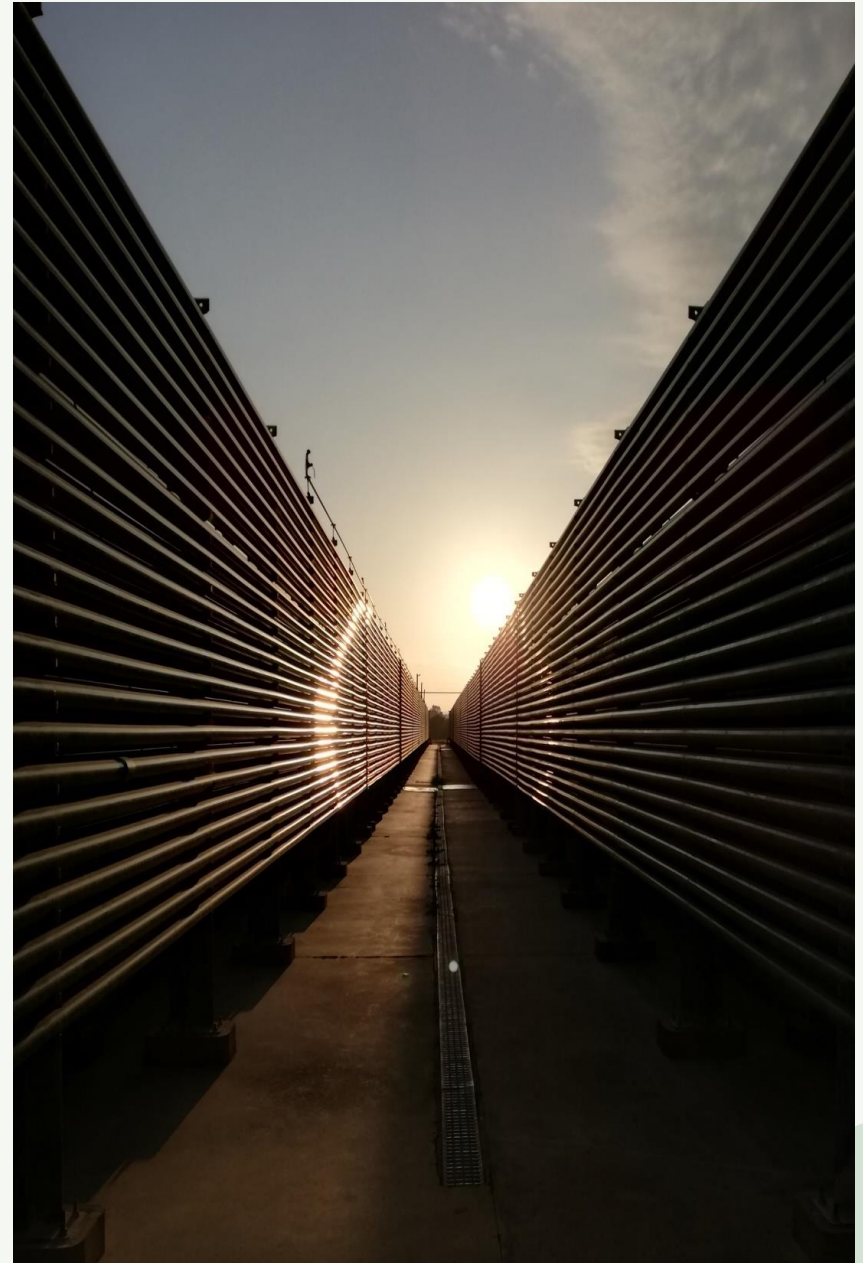


- Life Cycle Assessment (LCA)
- Environmental Impact Analysis
- Resource Efficiency Metrics

Strategies

- ✓ Increase productivities;
- ✓ Decrease input demands;
- ✓ Optimize input utilization
- ✓ Input recycling
- ✓ Maximize biomass rentability

Improvements need to be balanced with productivity and costs.



necton

- 1990
Pilot project spin-off from the University.
- 1997
Necton was founded.
- 2024
One of the oldest microalgae companies in Europe.

Focus:

High quality biomass for the cosmetics and fish aquaculture sectors, also entering the food market



Research & Development

Necton's R&D project pipeline

1990

2023

INTERNATIONAL:

“Pufatech” “Carotenoids” “Astaxanthin” “Alginet” “Pufafeed” “Phagevet-P”



NATIONAL:

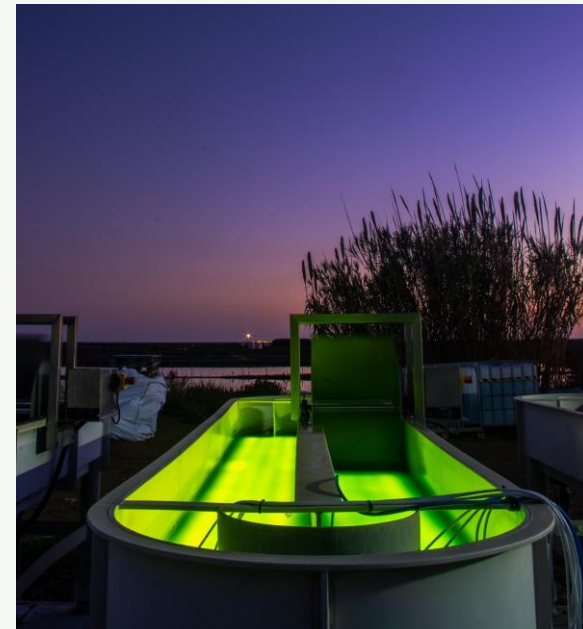
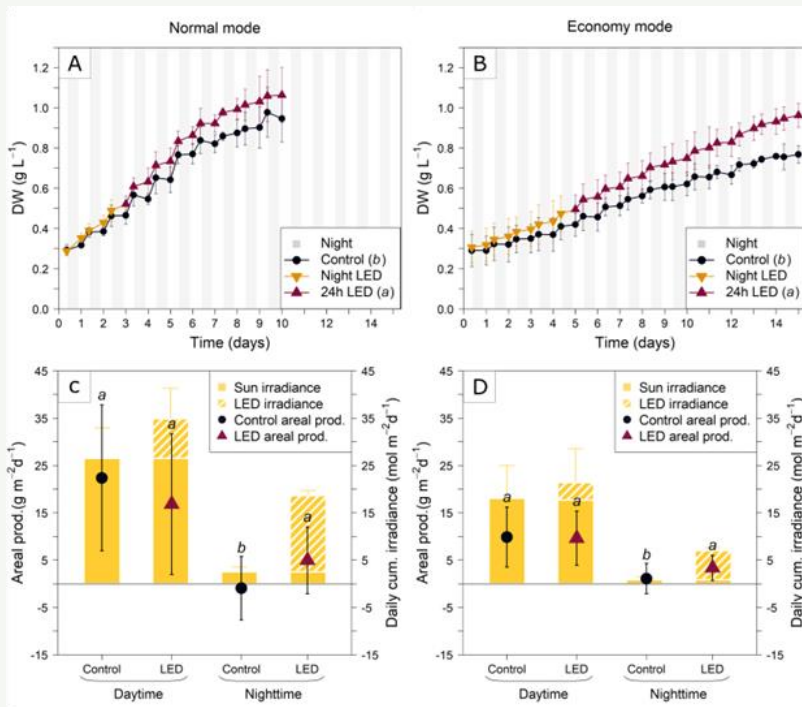
“Novalgas” “Aqualgas” “Carotenoides” “Biorecicla” “Overcaroten” “Botryofuel” “Antiviral” “Greendiets” “Size-matters”



Productivity Improvement Case – LEDs



- LEDs can offset the nighttime biomass losses (respiration)
- Artificial light can only be used for extremely high value bioproducts
- Sun light is the most sustainable light source for industrial cultivation



Cofinanciado por:



Areal productivity

MAGNIFICENT

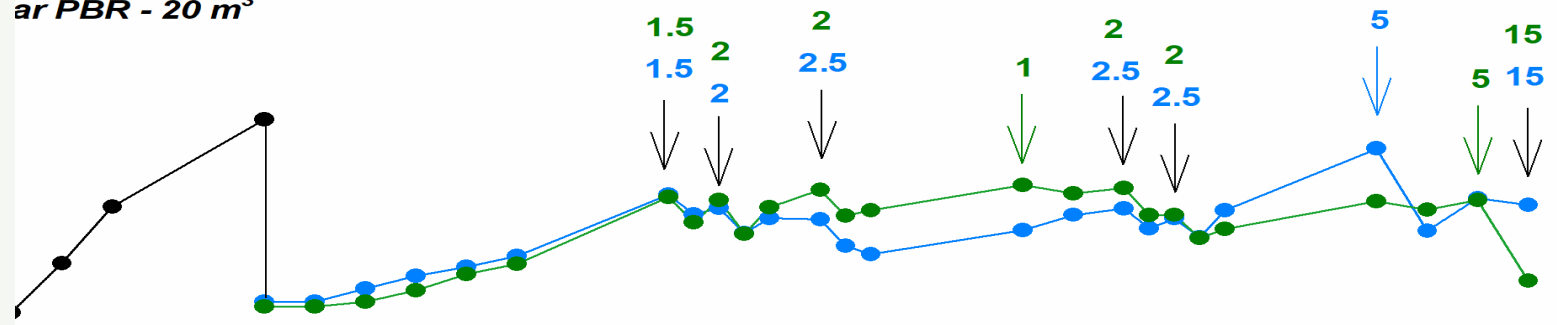
- Increase the production volume: 15 m³ → 20 m³
- Volume of culture per unit of area (m³ culture / m² ground area)



ar PBR

ar PBR - 15 m³

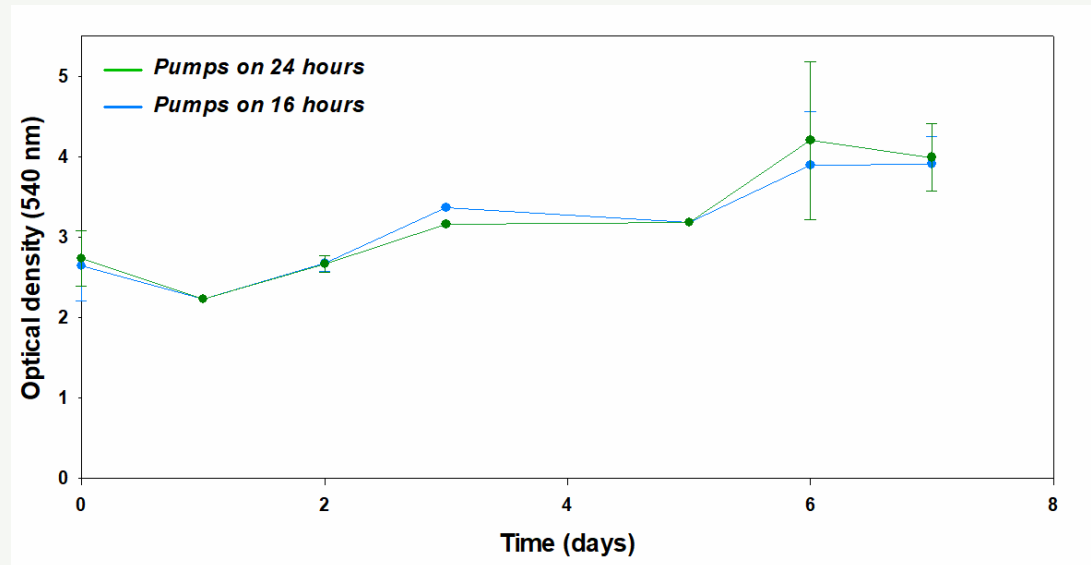
ar PBR - 20 m³



Energy Input Reduction

MAGNIFICENT

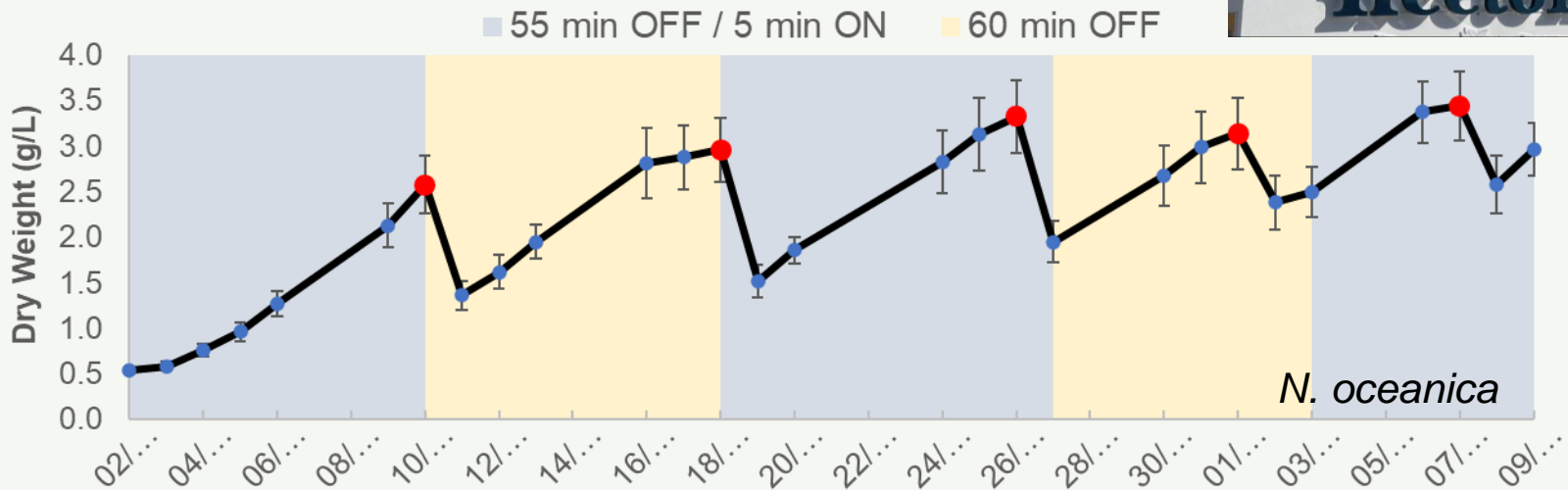
- ✓ Energy used to mix algal cultures represents a major economic and environmental cost
- ✓ Different production techniques allow to significantly reduce the energy demand (e.g., turn off mixing during night period)



Renewable Energy Integration

**PRO
FUTURE**

- Renewable energies are key to improve algae production sustainability
- Off-the-grid T-PBR (PV control pumps)





Solar drying

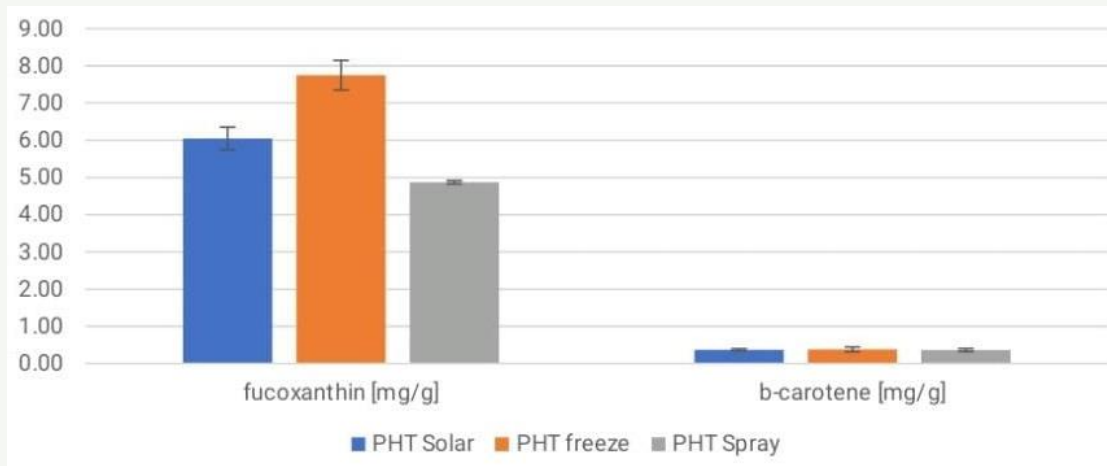
PRO
FUTURE

- Solar drying as a sustainable drying technique for the microalgae industry
- Solar dry vs freeze dry vs spray dry



<https://doi.org/10.3390/foods11131873>

P. tricornutum



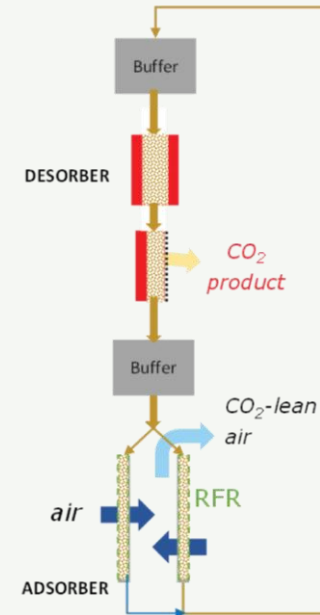
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 862980



CO₂ as a key input

PRO
FUTURE

- Inorganic carbon is key for industrial cultivation of photoautotrophic algae biomass
- Capture CO₂ from polluting industries to use in algae production facilities
- *In situ* direct air capture systems for CO₂ absorption and concentration from the air

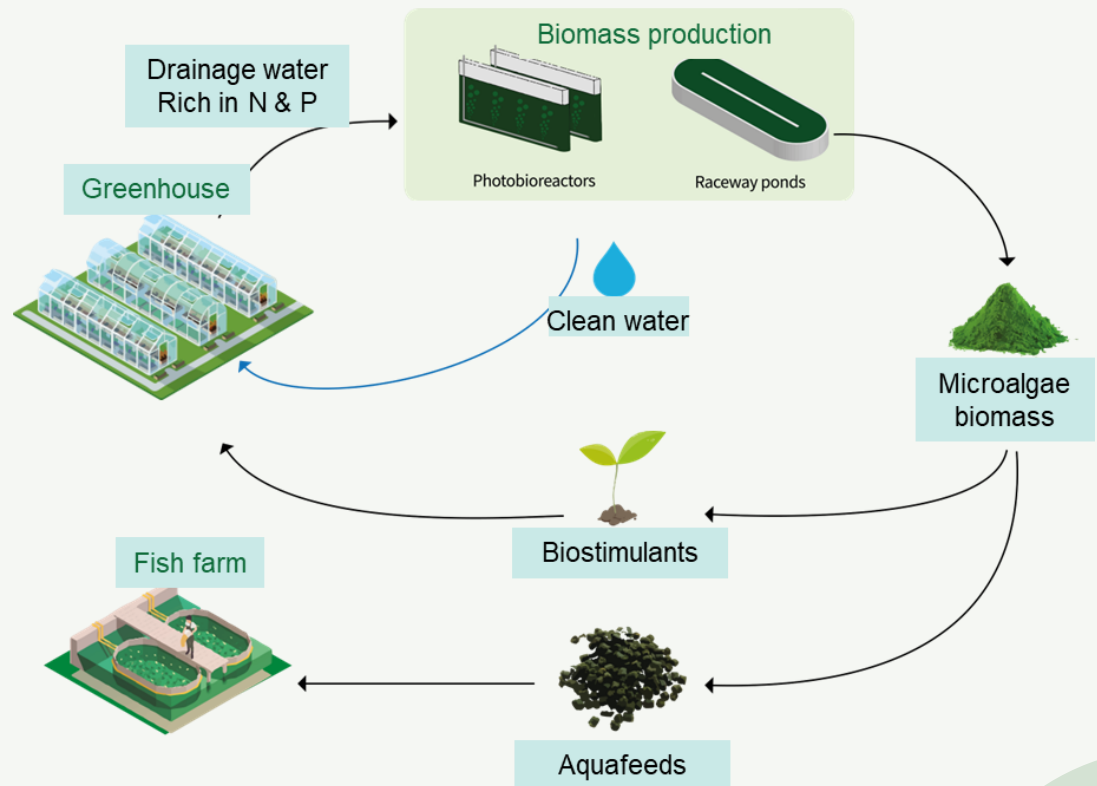


This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 862980

Water & Nutrient Recycling



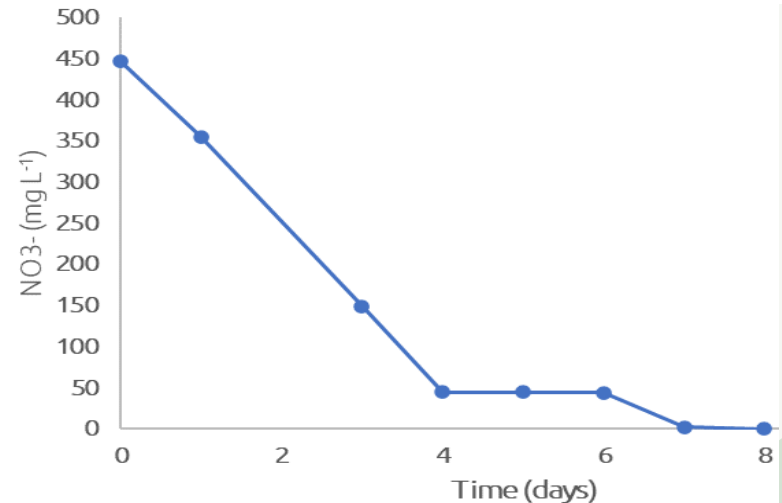
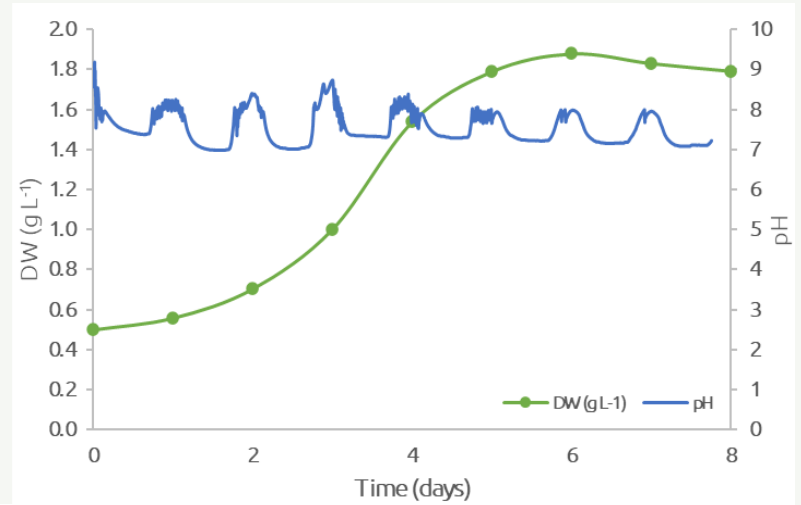
- Algae production requires massive quantities of marine and/or freshwater
- Addition of commercial inorganic or organic nutrients displays significant costs
- Reuse water and nutrients from adjacent industries
- Upgrade waste streams into value



Water & Nutrient Recycling



Scenedesmus sp.



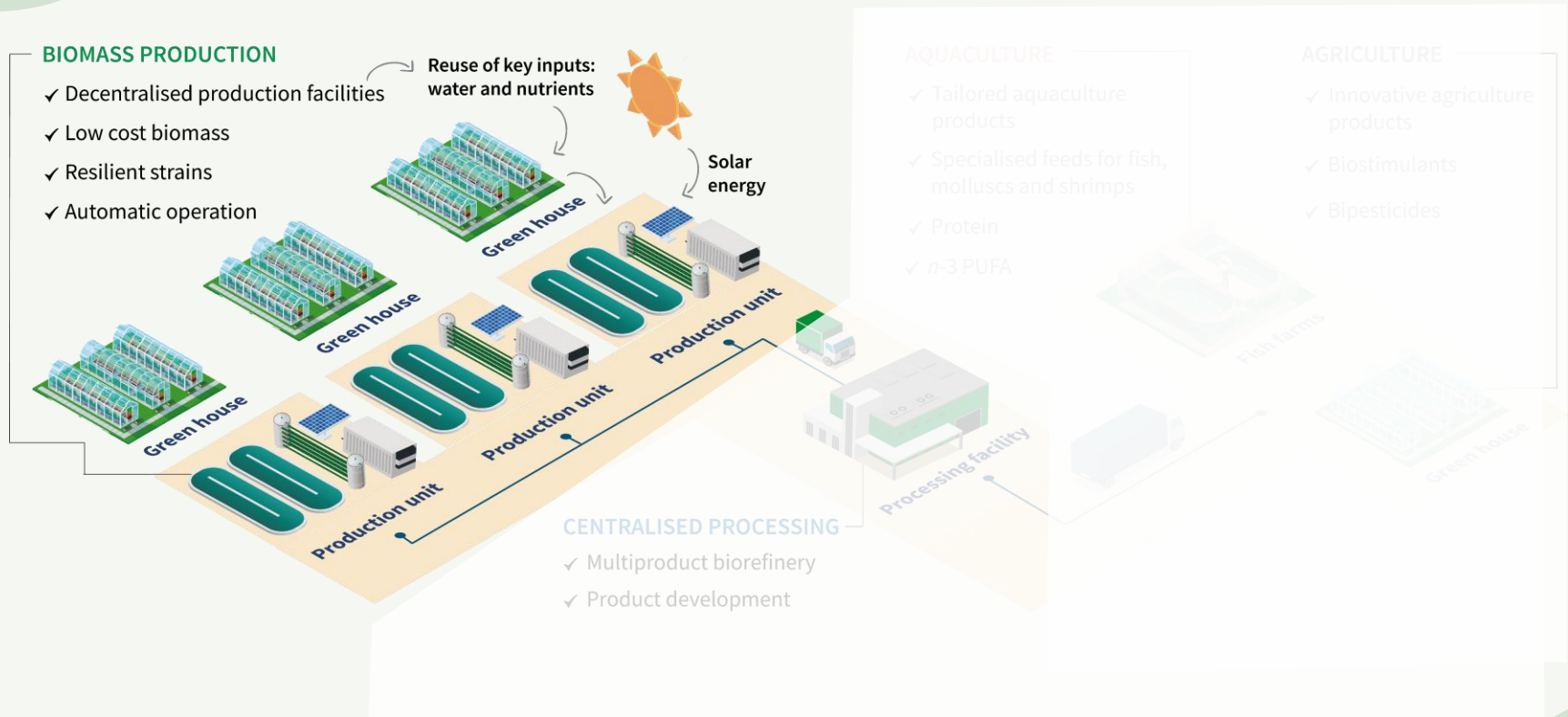
Funded by:

Iceland
Liechtenstein
Norway grants

Programme operator:
 Direção-Geral de
Política do Mar

 REPÚBLICA
PORTUGUESA
ECONOMIA E MAR

Input optimization





Take home messages

- There is still a long way to reduce technical bottlenecks of algae cultivation
- Evidence on environmental benefits and risks should be clear
- Better management of natural resources.
- Support the development of innovative, competitive and sustainable production is a team effort
- **Circular economy approaches are key for the future sustainability of the algae sector**



We
are
here

necton

Mariana Carneiro

mariana.carneiro@necton.pt

 **phytobloom**

<https://phytobloom.com/>

