



DE LA RECHERCHE À L'INDUSTRIE

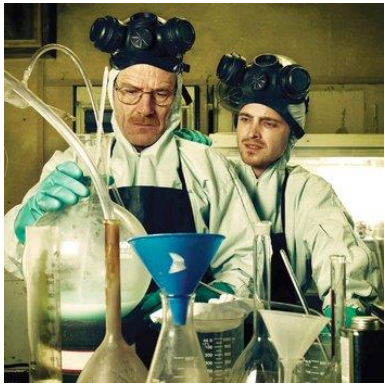
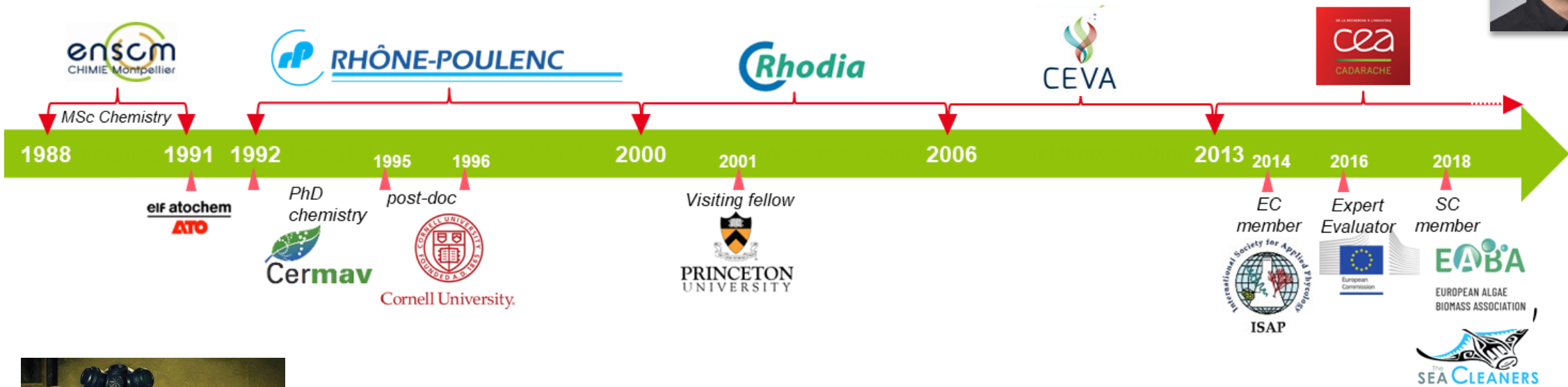
Follow the Starch Trek!

Algae as efficient feedstock producers for biobased chemistry

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@FoodInsight



Hydro-what-oids?
Hydrocolloids.



~ 30 years in applied industrial R&D: (biobased) ingredients for cosmetics, detergents, water treatment, plastics, pulp & paper, food/feed, nutraceuticals, agrochemicals, bioenergies

2013-2014 : (re)born from scratch



2020-2021 : let's push the walls



Today:
 >600 m² facilities
 A group of 10-15 researchers

Expertise

Develop

Prototype

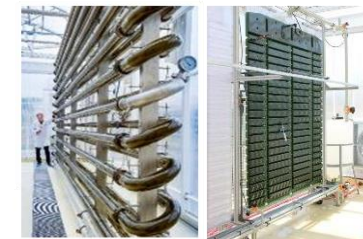
Demonstrate



Advice
 Team work
 Background
 knowledge
 & know-how
 Network



Lab-scale experiments
 (culture + DSP)
 Analytical characterization

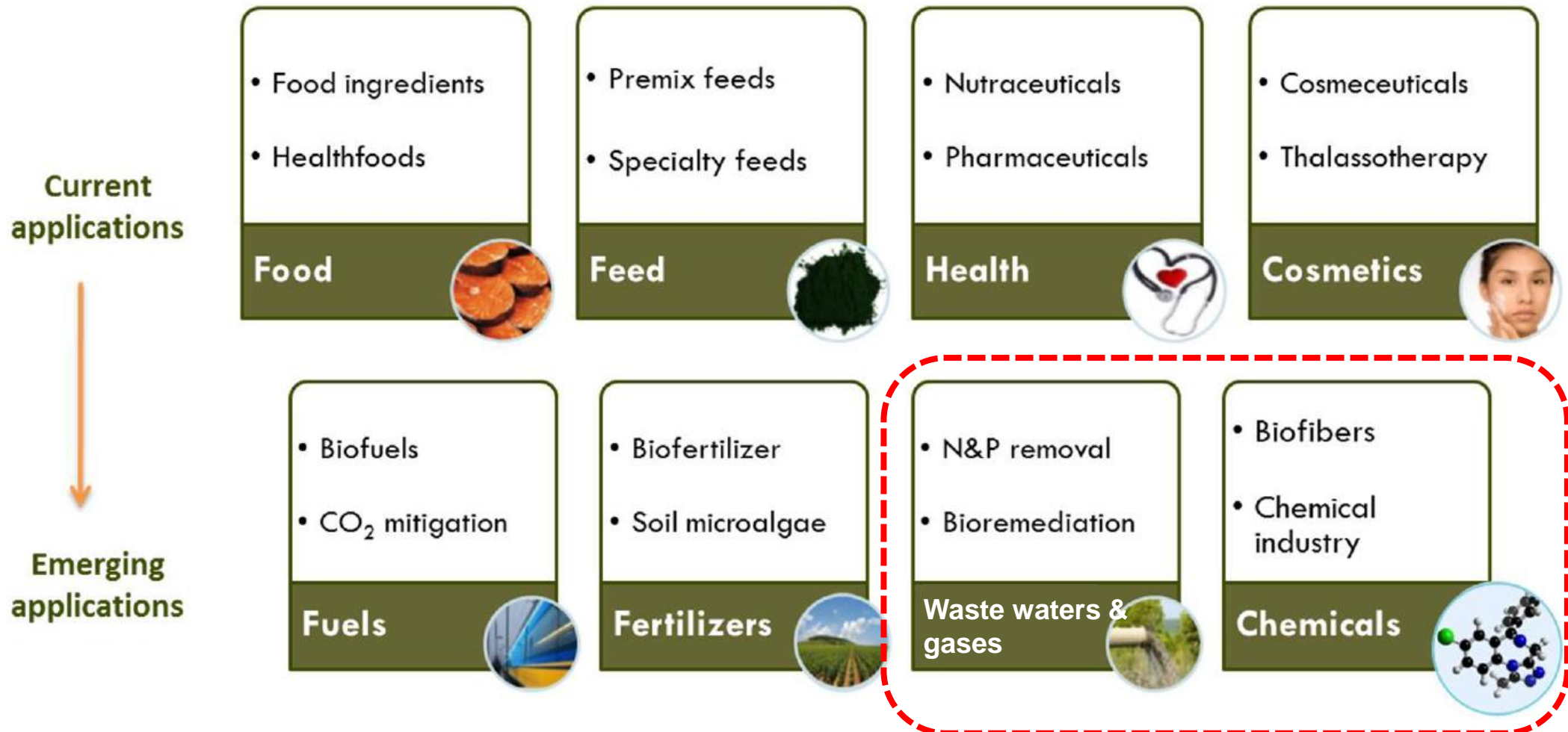


Semi-industrial pilots
 in real conditions
 (culture + DSP)
 Modelling & simulation
 LCCA



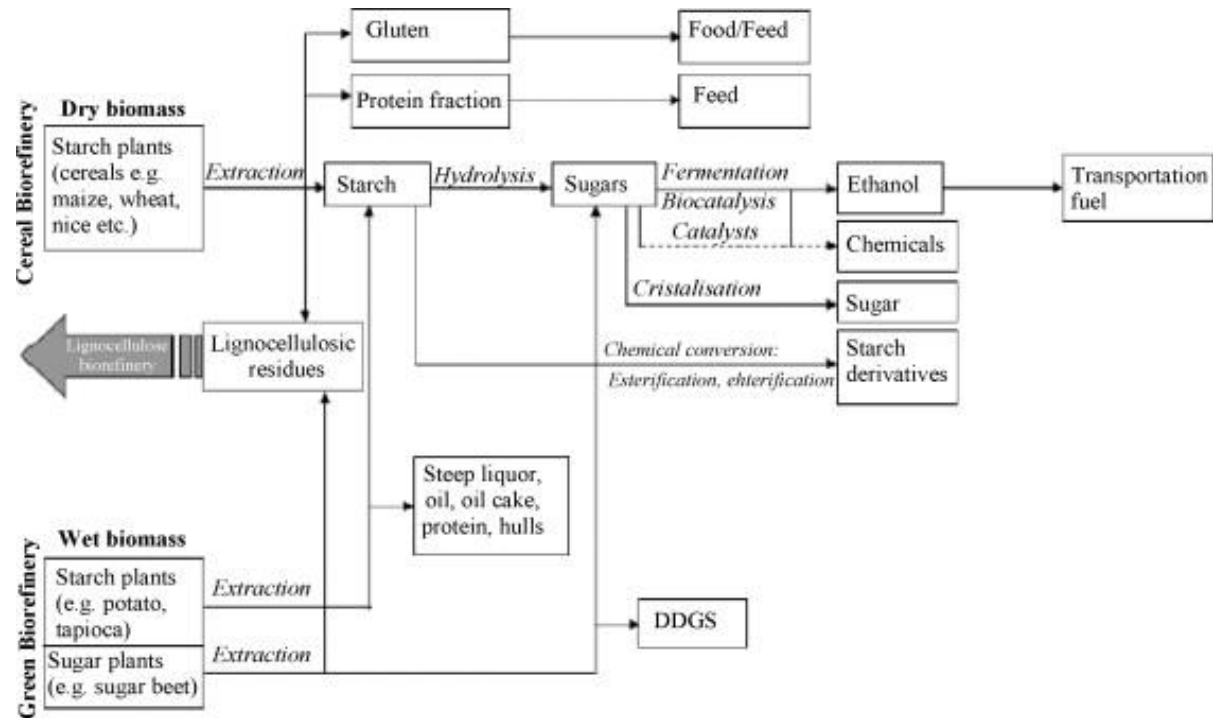
Transfer to 3rd party

- Develop project-based **EFFICIENT & INNOVATIVE PROCESSES** for the production of microalgae aiming at supporting the algae industry for applications on **EXISTING & FUTURE MARKETS**



WHY SHOULD WE PAY ATTENTION TO STARCH?

- Starch is a leading feedstock for biorefineries



S.N. Naika, V. V. Goudb, P. K. Routb, A. K. Dalaib (2010) Production of first and second generation biofuels: A comprehensive review. *Renewable and Sustainable Energy Reviews*, Volume 14, Issue 2, Pages 578–597



ROQUETTE
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Lestrem
(Northern France)



ard
L'INNOVATION VERTE

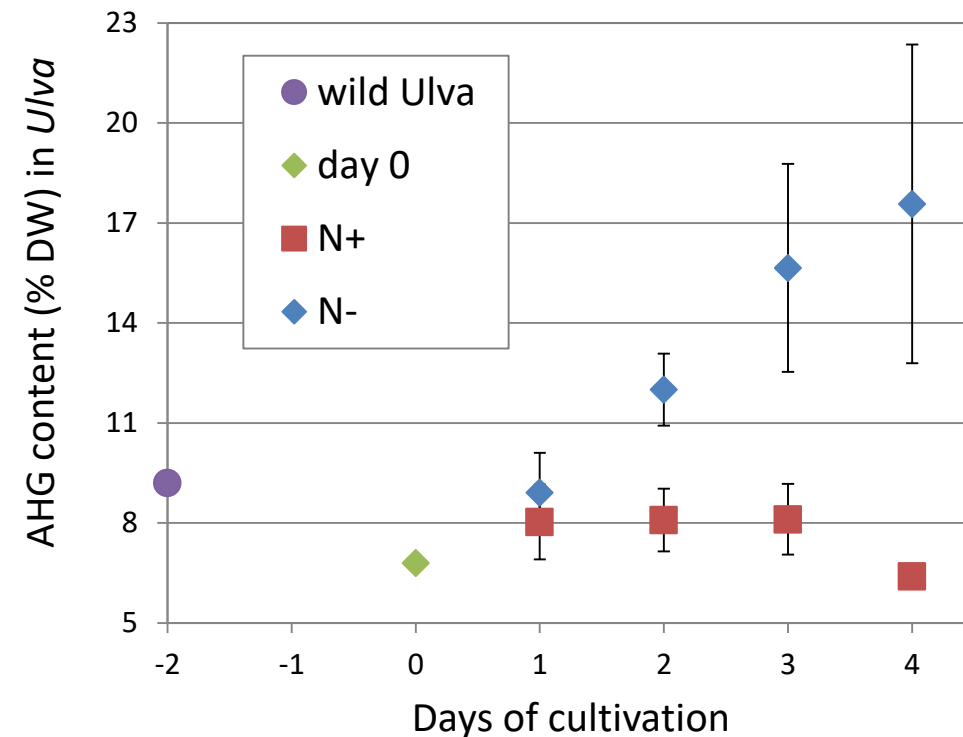
Pomacle-Bazancourt
(Champagne Region)

- Starch-based plastics = **80%** of current bio-based plastics



- *Ulva* rapidly alters its composition when culture conditions change
- Nutrient deficient conditions induce increase in starch content
- **Maximum starch content observed in *Ulva* was 40%/DW after 9 days of maturation**

(Champenois & Sassi, 2009, 2012)





Patents FR3012817 (7/11/2013) & WO2017046356 (17/09/2015)



wild inoculum



Starch enrichment in raceways



fractionation



Studio Klarenbeek & Dros and atelier LUMA - 2017



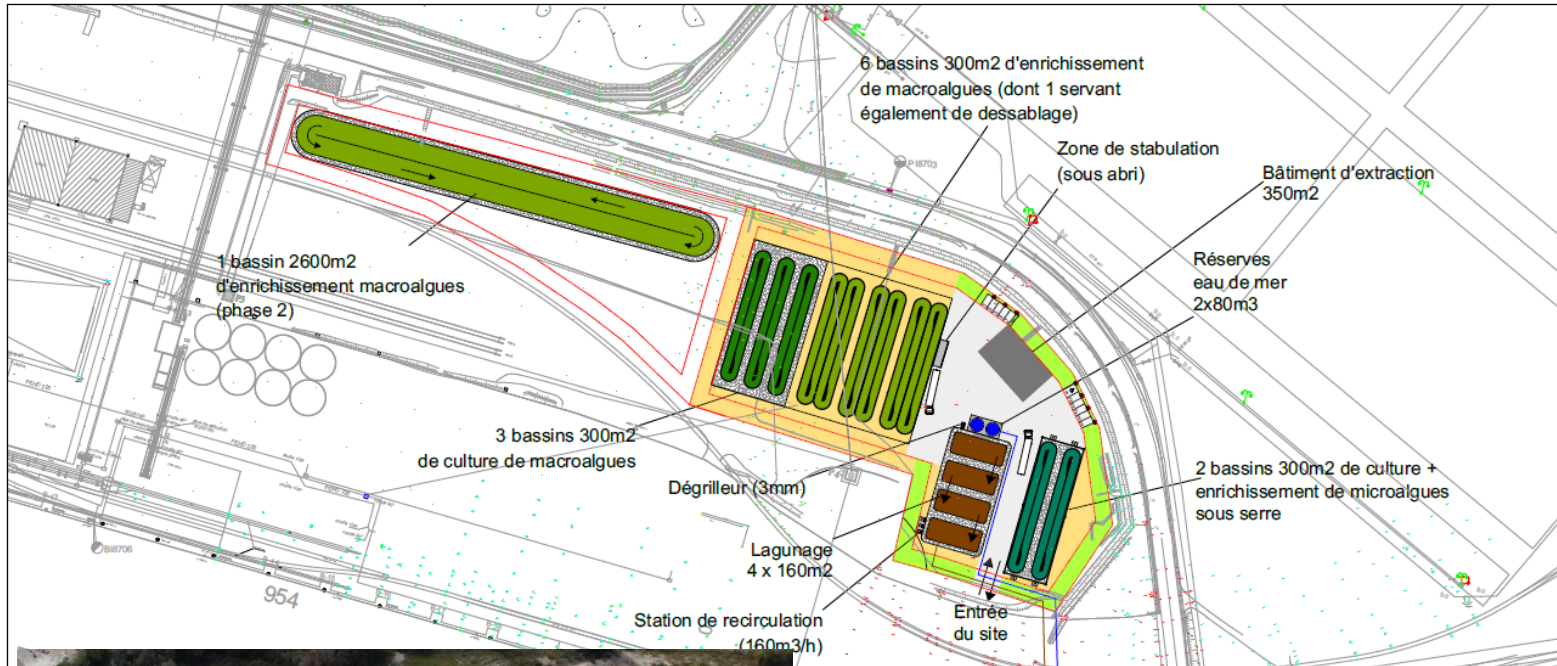
Plastic pellets



compounding & extrusion

ALGUEX: PRODUCTION OF ALGAL BIOMASS AND ALGAE-BASED PLASTICS IN PORT-ST-LOUIS-DU-RHÔNE, RÉGION SUD, FRANCE

ADEME

Agence de l'Environnement
et de la Mobilité de l'ÉnergieERANOVA
Technology from the seaFROM RESEARCH TO INDUSTRY
ceatechINSA INSTITUT NATIONAL
DES SCIENCES
APPLIQUÉES
LYON
imp

■ Demo-scale (2022):

- 6M€ CAPEX
- 13 direct jobs

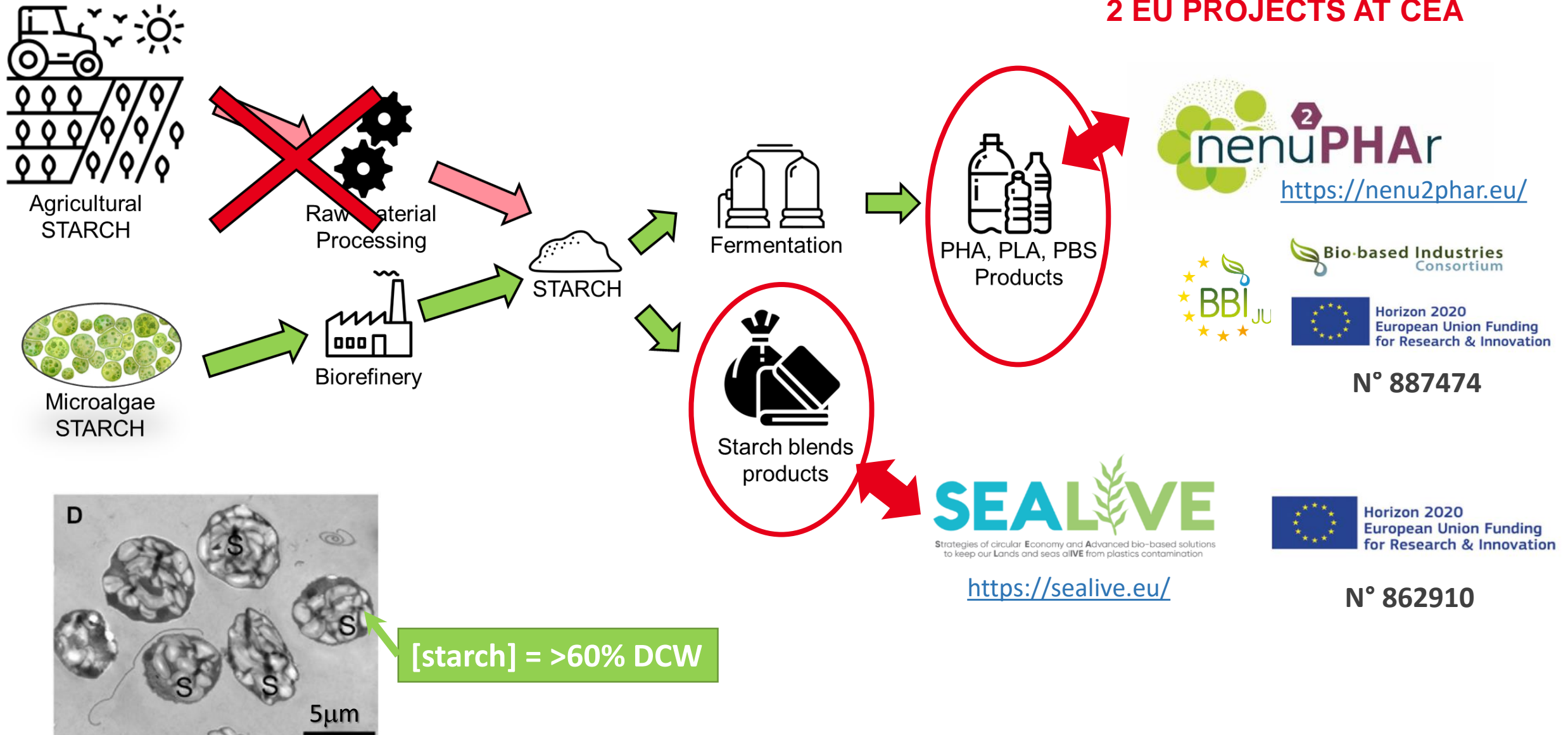
■ Next: 30 ha unit

- Turnover 34 M€
- 60 direct jobs
- 40 indirect jobs
- 10kT/year bioplastics

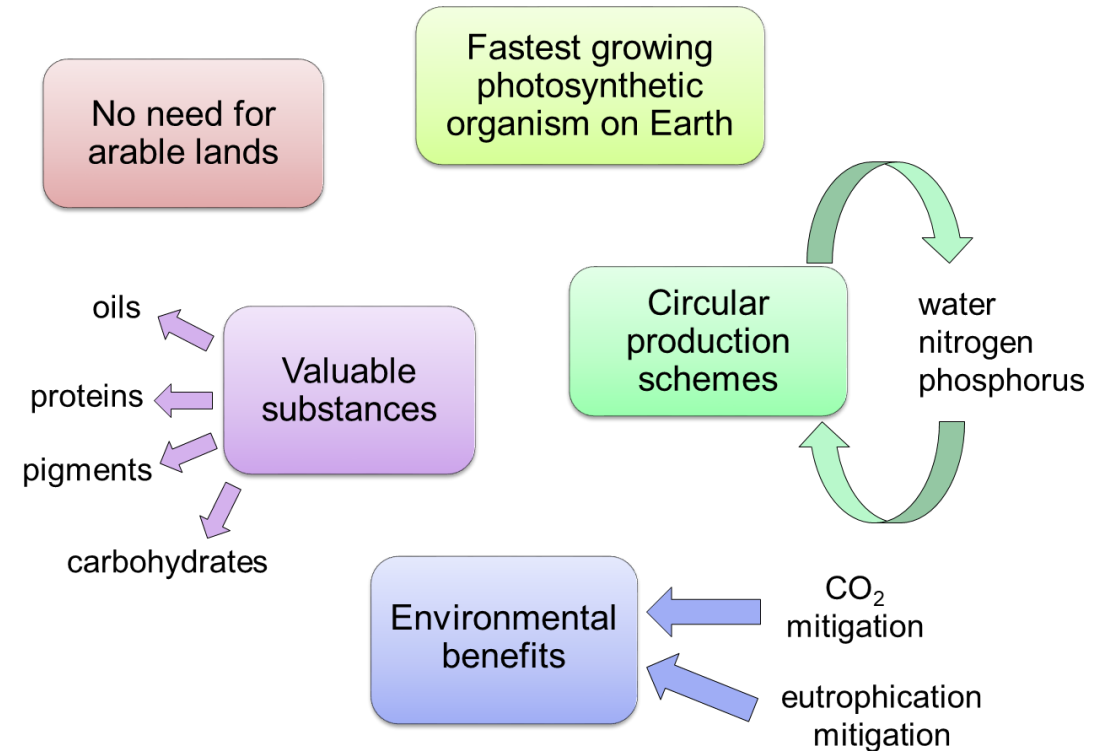


Philippe Lavoisier
DG ERANOVA

2 EU PROJECTS AT CEA



- Algae could become a source of blockbuster raw materials for biobased chemistry such as carbohydrates & fats
- Metabolic pathways can be oriented towards efficient production, thanks to adequate strain selection and process optimization
- Take advantage of the switch of petrochemistry to biobased, carbon circular economy!!



Pictures: courtesy of the Algae Lab, Atelier LUMA, Arles, France & ERANOVA, France & Wonder Alpine, USA <https://wndr-alpine.com/pages/technology>

The logo for CEA (Commissariat à l'énergie atomique et aux énergies alternatives) is displayed in white lowercase letters on a red square background. A thin green horizontal line is positioned below the letters.The logo for the Provence-Alpes-Côte d'Azur region. It features the text 'RÉGION SUD' in bold black letters, followed by the regional coat of arms (a shield with a crown and a sun) and the text 'PROVENCE ALPES CÔTE D'AZUR' in black letters.

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Merci de votre attention!