Valorization of Biogas Byproducts for Microalgae Protein Production

Georgina del Puerto-Tañà[1,2]*, Marcella Fernandes de Souza[2], Josué González Camejo[1], Sergio Ponsá[1], Erik Meers[2]

[1]*BETA Technological Center. Universitat de Vic-Universitat Central de Catalunya Ctra. de Roda, 70. 08500 Vic-Barcelona, Spain.*
[2]*Laboratory for Bioresource Recovery (RESOURCE), Department of Green Chemistry and Technology, Ghent University, Coupure Links 653, 9000 Ghent, Belgium*
**Corresponding author. E-mail: georgina.delpuertotana@ugent.be*

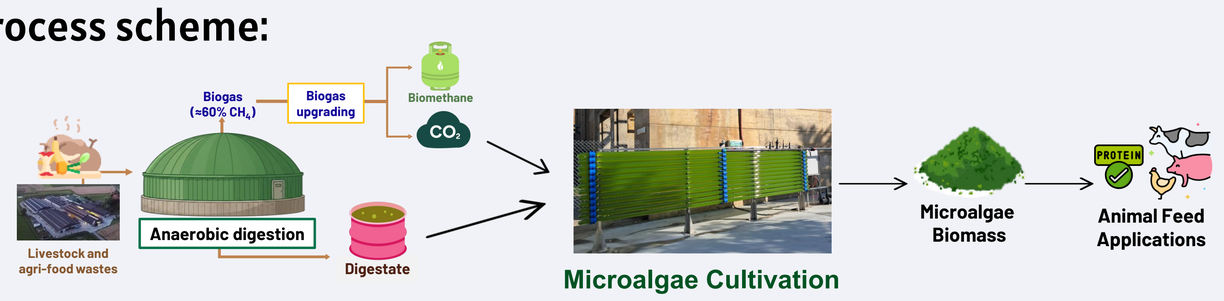
BACKGROUND

- In conventional biogas plants, **carbon dioxide (CO_2)** is largely emitted into the atmosphere, while the resulting **digestate** faces disposal constraints due to high nutrient loads.
- Within the **SEMPRE-BIO project** (www.sempre-bio.com), these byproducts are revalorized to cultivate **microalgal biomass**; CO_2 serves as carbon source, while digestate provides nitrogen (N), phosphorus (P), and micronutrients.
- Microalgae-digestate systems have high potential to convert N from digestate into high-value algae protein for animal feed. This provides recovery of byproducts into promoting the sustainability of livestock and agricultural sector.

AIM OF THE STUDY

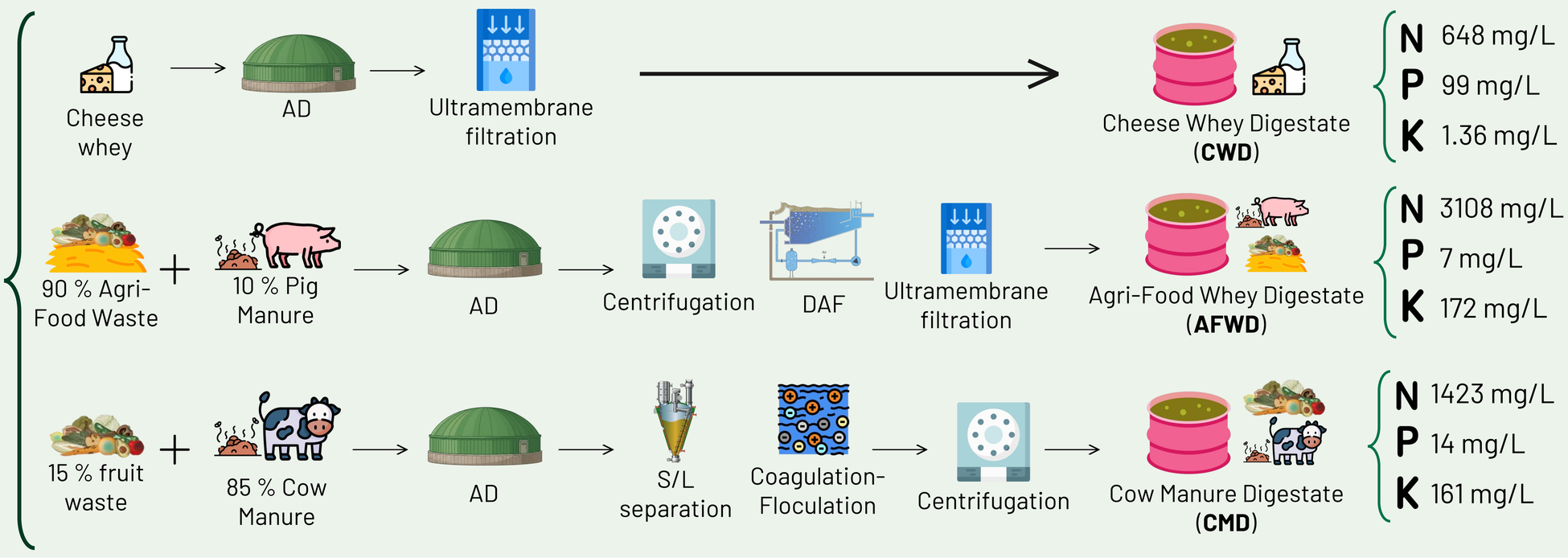
Comprehensive screening in the lab scale of 3 microalgae strains and 3 digestate to select the most appropriate conditions for further pilot-scale cultivation for microalgae biomass and protein production.

Process scheme:



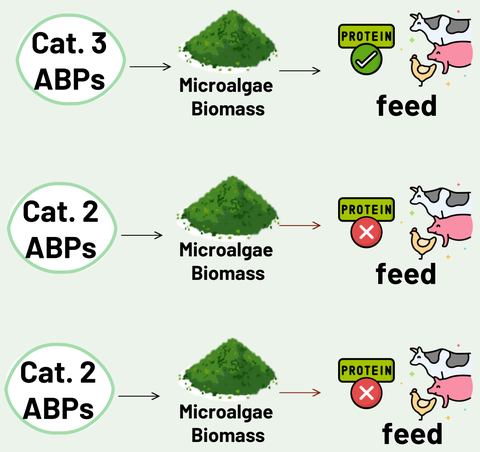
METHODOLOGY

3 Liquid Fractions of Digestates

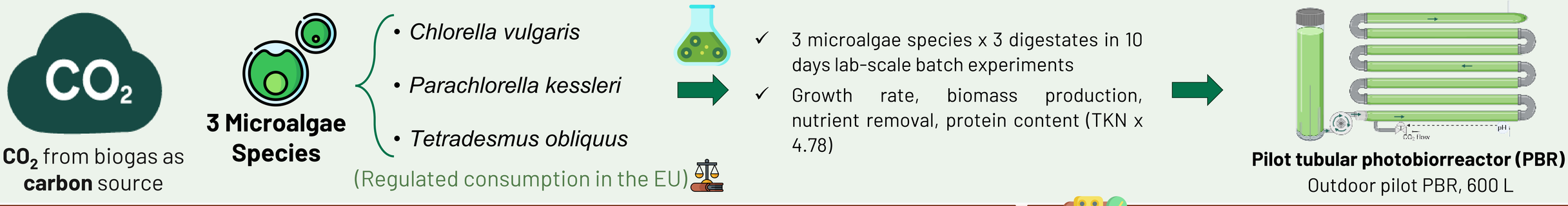


Regulatory framework

Is this algae biomass currently approved for feed purposes?
(EU Regulation 1069/2009)



ABPs = animal by-products



RESULTS

Biomass production

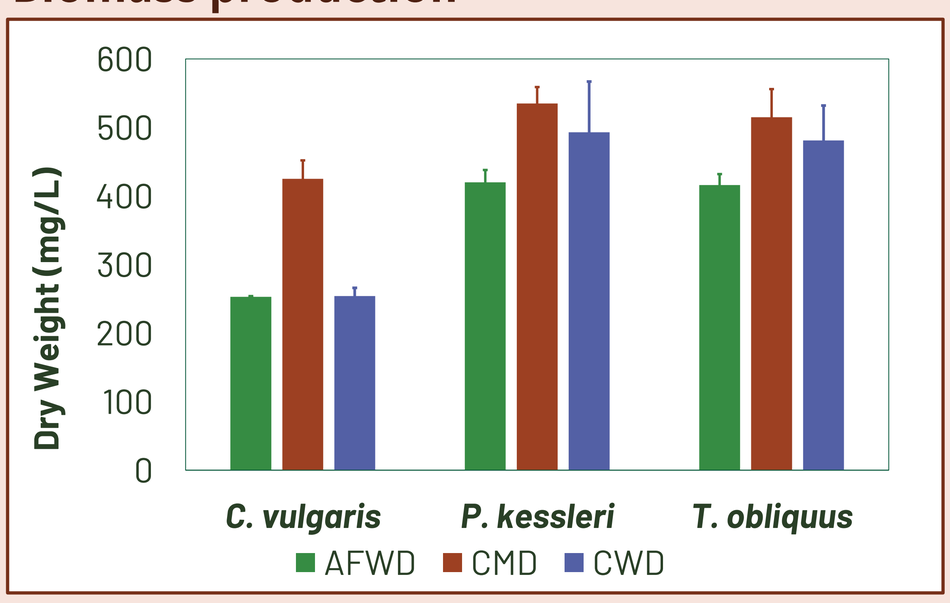


Figure 1. Biomass yield (Dry Weight, mg/L) of *C. vulgaris*, *P. kessleri*, and *T. obliquus* in Agri-food waste digestate (**AFWD**), Cow-manure Digestate (**CMD**), and Cheese Whey Digestate (**CWD**).

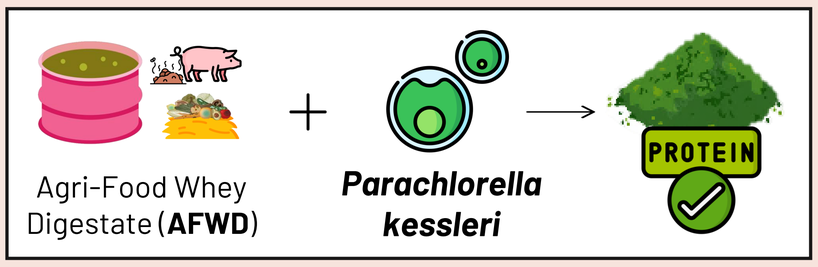
The 3 digestates supported suitable biomass growth.

In most conditions, microalgae biomass reached **high protein content** (30-50 %).

CONCLUSIONS

Selected conditions:

- ***Parachlorella kessleri*** had the most stable results between different digestates in comparison to the tested species.
- **AFWD** is an interesting option; it contains 10% pig manure (high livestock activity in the Catalan region), and the filtration processes increases its applicability.
- Therefore, the selected conditions for the pilot-scale operation will be:



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