Demonstration of small-scale biogas upgrading at a dairy farm: the Flemish case study of SEMPRE-BIO

Ç. Akyol[1]*, M.F. de Souza[1], S. Katti[1], A. Munaretto[2], J.B. Joos[3], A. Chamaa[3], T. Vergote[4], C. Wyffels[4], W. Masscheleyn[5], E. Michels[1], E. Meers[1]

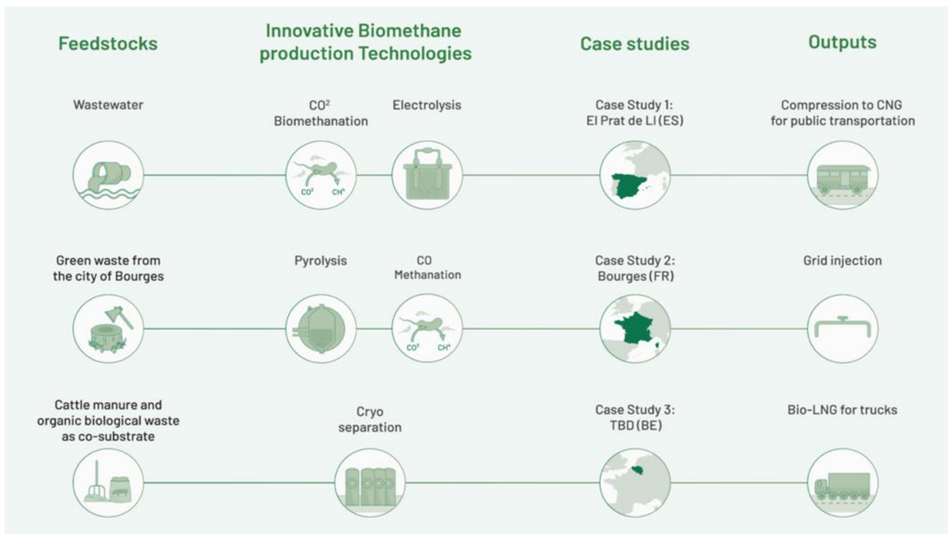
[1] *Ghent University, Coupure Links 653, Ghent, Belgium, *cagri.akyol@ugent.be*
[2] *Cryo Inox SL, Barcelona, Spain*
[3] *Innolab, Oostkamp, Belgium*
[4] *Biogas-E, Kortrijk, Belgium*
[5] *De Zwanebloem, Adinkerke, Belgium*

SEMPRE-BIO Project

SEMPRE-BIO aims to demonstrate **novel and cost-effective biomethane production solutions** and pathways, deemed essential to achieve the European Green Deal and climate and energy targets for 2030 and the net zero greenhouse gas emissions by 2050, and to increase the market up-take of biomethane related technologies.

The SEMPRE-BIO EBIEs

SEMPRE-BIO takes technological solutions FROM MODELS TO REALITY in 3 **European Biomethane Innovation Ecosystems (EBIE)** where 5 biomethane innovations technologies are tested. These EBIE's are co-developed to demonstrate the need for specific retrofitting and scale-up approaches and will contribute to accelerate the development and uptake of novel biomethane production technologies across Europe.



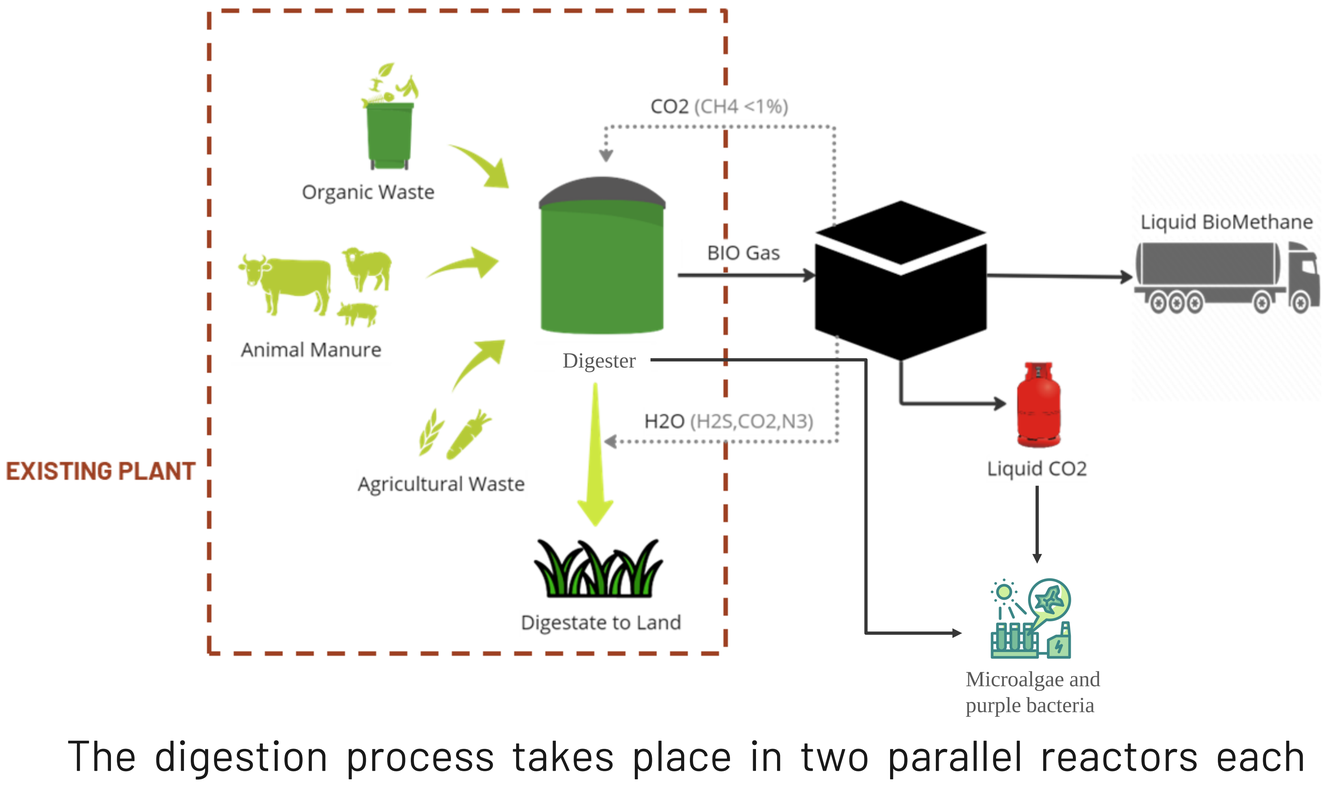
CS1: Aigües de Barcelona, Barcelona, Spain

CS2: Bourges, France

CS3: De Zwanebloem, Adinkerke, Belgium

The Flemish case study

The Flemish case study (CS3) at a **dairy farm** (~1500 cows) in Adinkerke aims to pioneer and showcase inventive **biogas upgrading** technologies and facilitate the enhancement of existing biogas and biomethane facilities, particularly those operating at lower capacities (<100 Nm^3 biogas/h), which are at risk of ceasing operations due to discontinued incentives or rising feedstock costs.



The digestion process takes place in two parallel reactors each with a volume of 2.700 m^3 (the latter being a **thermophilic post-digester**), which are fed with **on-farm manure** and a limited amount of other organic waste to optimize the process (approx. 25.000 t/y manure and 5.000 t/y other co-substrates). The biogas upgrading unit is a **cryogenic process** that enables the separation of CO_2 from biogas to obtain a **food-grade quality of CO_2**. The resulting biomethane, with a CO_2 concentration less than 1%, is then cooled, liquefied, and polished. Both **liquid biomethane and liquid CO_2** are valuable and versatile resources with a wide range of industrial and energy applications.

A part of the excess **digestate**, together with the liquid CO_2, are then used to grow **microalgae** and **purple bacteria** as alternative protein sources for animal feed, which can potentially reduce local soybean imports. The remaining part can then be transported to arable lands in France, in need of such **organic fertilizers**, since thermophilic post anaerobic digestion meets hygienization requirements of the Regulation (EC) 1069/2009 that would allow export across the Belgian border.

Funded by the European Union

The SEMPRE-BIO project has received funding from the European Union's HORIZON-CL5-2021-D3-03-16 programme under grant agreement № 101084297. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.