



LIFE Biomass C+ - Low-cost, carbon positive bioethanol production with innovative Green Floating Filters in multiple water bodies

LIFE16 CCM/GR/000044



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Project description:

Background

CO<sub>2</sub> is the primary greenhouse gas emitted by human activity, and the combustion of fossil fuels for energy and transportation are the primary sources of these emissions. Biofuels like bioethanol and biodiesel are known to have measurable greenhouse gas benefits over traditional fossil fuels due to lower emissions during their production life cycle. However, most biofuels are produced from crops, such as wheat, corn, sugar cane and sugar beet, and are currently more expensive and less available than fossil fuel. Most biofuel crops are also produced on agricultural lands that could also be used for food production. The expansion of these crops can negatively affect other areas, such as peatlands and grasslands.

Objectives

LIFE Biomass C+ aims to demonstrate improvements in climate mitigation strategies through the production of sustainable biofuel. This will be achieved through an innovative green technology, Green Floating Filters (GFF), whereby aquatic macrophyte plants are grown in multiple water bodies. Existing and underused infrastructure and water resources (ponds, lakes...) will be used to produce zero-input biomass with high starch content, which will then be converted into bioethanol and eventually biofuel.

The specific goals of the project are to:

- Develop a clean, dependable method to produce biofuel without using agricultural land, addressing the challenge of the 7% limit on biofuels produced from food crops by testing an innovative method to produce water-sourced biomass that is not in competition with agricultural land and offers a potential starch yield equal or higher than wheat;
- Provide a carbon-positive energy balance and other environmental benefits by realising important greenhouse gas emission savings and improving water quality and local biodiversity through the filtering and decontaminating effect of the GFFs' rhizomes;
- Demonstrate the applicability of Biomass C+ on an industrial scale, proving that the concept is directly replicable; and
- Demonstrate the potential and cost-effectiveness of this new close-to-market concept.
- The innovative component of Biomass C+ is its use of water bodies to grow the biomass. The root system of the macrophyte plants absorbs heavy metals and other pollutants in the water. The plants are not suitable for either human or animal consumption, and are therefore not competing with food crops. The project also addresses land use change, contributing to EU policy priorities on several counts, including:
  - Improved carbon emission reduction and resource efficiency across agriculture and land use sectors;
  - Monitoring and accounting of carbon stocks through the development of an effective method for Life-Cycle Assessment (LCA) of water-sourced biomass production;
  - Exploration and facilitation of low-carbon production and transformation of biomass; and
  - Strengthening of low-emission farming practices with a transformational impact.

In addition, the Biomass C+ project contributes towards the EU target of reducing greenhouse gas emissions by 40% and increasing energy efficiency by 27% before 2030, as set out in the climate and energy framework. Finally, the project's focus on the improvement of biodiversity and ecosystem services of the different water bodies where the biomass is grown corresponds to the EU 2020 Biodiversity Strategy, which emphasis the need to maintain and restore ecosystem services.

Expected results:

- A reduction of greenhouse gas emissions of around 250 tonnes of CO<sub>2</sub> through a detailed study that measures the total CO<sub>2</sub> emitted in tonnes/ha for the production of macrophyte biomass compared to traditional fuel crops like wheat or corn;
- Demonstration that the Biomass C+ concept is feasible for any kind of large water body on an industrial scale, proving that GFF can be utilised in areas where climate, water flow and temperature cannot be controlled;
- Demonstration of the concept both at lab and industrial scale, showing that the sustainably produced biomass can be effectively converted into bioethanol and blended into biofuel ;
- The efficacy of the macrophyte shown to be suitable green filter that promotes water quality improvement of at least 30% at the demonstration sites, both biologically (e.g. reduction in algae blooming) and chemically (reduction of pollutants);

- Replication of results and market uptake during the project's lifetime.

## Results

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Environmental issues addressed:

Natura 2000 sites

Not applicable

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Beneficiaries:

Coordinator	CENTRE FOR RESEARCH & TECHNOLOGY HELLAS
Type of organisation	Research institution
Description	CERTH is a non-profit entity organised under private law under the auspices of the General Secretariat for Research and Technology of the Greek Ministry of Development.
Partners	Universidad Politécnica de Madrid, Spain COMUNIDAD DE REGANTES DE EL ARENAL, Spain VOLTERRA ECOSYSTEMS SL, Spain Hellenic Petroleum S.A., Greece Biostream B.V., The Netherlands

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Administrative data:

Project reference	LIFE16 CCM/GR/000044
Duration	01-SEP-2017 to 26-FEB -2021
Total budget	1,901,696.00 €
EU contribution	1,125,115.00 €

Project location

Madrid(España) Castilla-León(España)  
Cataluña(España) Anatoliki Makedonia,  
Thraki(Ellas) Kentriki Makedonia(Ellas) Dytiki  
Makedonia(Ellas) Thessalia(Ellas) Ipeiros(Ellas)  
Ionia Nisia(Ellas) Dytiki Ellada(Ellas) Sterea  
Ellada(Ellas) Peloponnisos(Ellas) Attiki(Ellas)  
Voreio Aigaio(Ellas) Notio Aigaio(Ellas)  
Kriti(Ellas) Gelderland(Nederland)

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