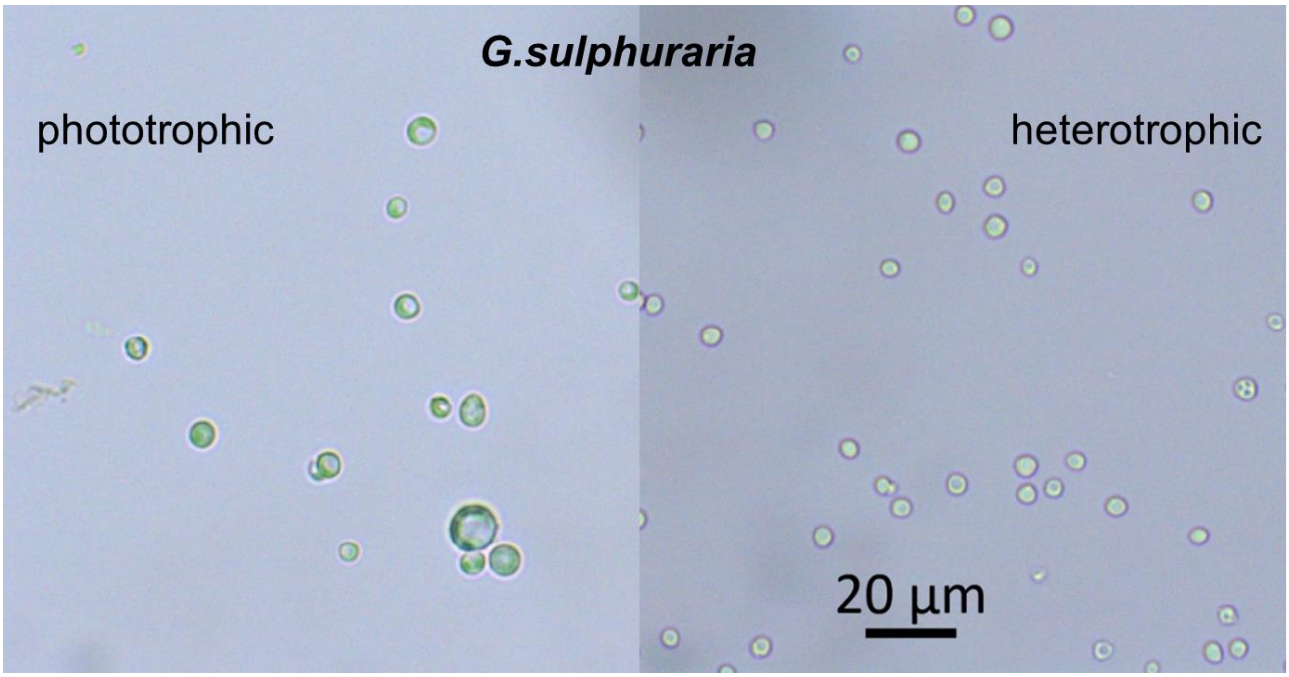
Letter to Stakeholder

CLIMAQUA:

Establishing an innovative and transnational feed production approach for reduced climate impact of the aquaculture sector and future food supply



FOSC ERA-NET Cofund on Food Systems and Climate

CLIMAQUA

This project has received funding from the European Union´s Horizon 2020 research and innovation programme under grant agreement No 862555.

Project partners:

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Dr. Sissel Albrektsen, Nofima – Norway

Dr. Janna Cropotova, Norwegian University of Science and Technology (NTNU) – Norway

Dr. Idan Chiyanzu, Agricultural Research Council (ARC) – South Africa

Dr. Eliud Kireger, Hannington Odido, Kenya Agricultural and Livestock Research Organization (KALRO) - Kenya

Prof. A. Keith Cowan, Institute for Environmental Biotechnology, Rhodes University (EBRU) – South Africa

Introduction

The main objective of CLIMAQUA is to develop a flexible system to produce *Galdieria sulphuraria* biomass that can be used in a decentralized manner in the areas of aquaculture and fish processing, thus contributing to regional development and the reduction of greenhouse gases. The scientific, but also technical working objective of the project is the development of feed production technologies adapted to local environmental conditions based on *A. platensis* in combination with the treatment of low-value side streams and the recycling of nutrients from inorganic and organic wastewater, sludge, and fish residues from aquaculture.

Project organisation

The CLIMAQUA project is set for a timeframe of three years with contributions by four European and three African partners. Whilst the Institute for Food and Environmental Research (ILU, Germany) has oversight of the project.

It is funded within the FOSC (Federal Office for Agriculture and Food) collaboration, which aims to achieve food and nutrition security and sustainable agriculture in the context of climate change.

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FOSC is the ERA-Net on Food Systems and Climate. FOSC is built upon and supported by the experience from the Joint Programming Initiative on Agriculture, Food Security & Climate Change (FACCE-JPI) and the ERA-Net Cofund LEAP-Agri. The FOSC consortium consists out of 28 partners from Europe, Africa and Latin America. FOSC pulls together resources for a joint research programme and is supported by the European Commission through an ERA-Net Cofund grant. FOSC has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 862555. The program started on 1st October 2019 and will run until 30th September 2024.

Relevance

CLIMAQUA aims on novel strategies making feed production based on plant meals and rice, which are grown on arable land, or the supplementation with vitamins/mineral premixes obsolete. Particularly the minimised dependency on arable land is an essential measure for dealing with climate change caused dry and exhausted soils in Africa and Europe in the future. The reduction of climate gas emissions, when developed technology is implemented, is expected by 50%.

Intermediate results

Institute for Food and Environmental Research (ILU)

- Cultivation of *G. sulphuraria* with different aquaculture by-products (residues from fish hydrolysate production as well as sediment as mixture of fish faeces and feed residues) to compare growth under photo-, mixo- and heterotrophic conditions. Heterotrophic growth has been found strong in presence of glycerol and glucose as well as in hydrolysates obtained from fish residues.
- Further optimization of growth conditions has been carried out. This was particularly necessary as *G. sulphuraria* did not tolerate high hydrolysate concentrations and proper dilutions had to been found. *G. sulphuraria* was grown on residues until a biomass concentration of more than 70 g L^{-1}.
- The residue produced from hydrolysis is considered preferred substrates for use in the project.
- Project and first results have been presented at European conferences.
- The results obtained will be published open access.

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German Institute of Food Technology (DIL)

- Review article „Transformation of seafood side streams and residuals into valuable products" has been published and is available open access.
- Working on preparation of Life Cycle Assessment model.
- Based on the laboratory results obtained by ILU regarding the cultivation of *G. sulphuraria* a cultivation at 30 L scale is currently under progress.

NOFIMA

- In 2023, Nofima will produce practical formulated diets that meet all the nutritional requirements of juvenile Atlantic salmon and evaluate the nutritional potential of heterotrophically grown *G. sulphuraria* biomass at Nofima's Research Station for Aquaculture.
- The algae biomass will be added at 3 – 5 dietary levels, and the biological impacts on feed intake, growth, digestibility, and protein retention efficiency will be measured.
- Protocols for preparing of safe feed formulations, and for evaluation of the biological potential of *G. sulphuraria* as a protein source in feed for Atlantic salmon will be produced.

Norwegian University of Science and Technology (NTNU)

- In the period of June-December 2021, NTNU has produced 23.3 kg hydrolysates, 3.6 kg oil and 7.4 kg residues from rainbow trout raw material by enzymatic hydrolysis.
- The obtained products (except the oil) were subjected to physicochemical analysis, spray-dried and sent to the project partners.
- NTNU further supplied residues from rainbow trout raw material by enzymatic hydrolysis for the cultivation of *G. sulphuraria* at larger scale.
- The proximate composition and physicochemical analysis displayed a very high-quality product (hydrolysates) and by-product (residues from hydrolysis) that aimed to be used by ILU for cultivation of algae along with sediment.
- Project and first results have been presented at European conferences.

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Kenya Agricultural and Livestock Research Organization (KALRO)

- preparatory work is still in progress, as the biggest part of the work will come in the 3rd year of the project with outdoor cultivation of *G. sulphuraria* at pilot scale, fish feed formulation, catfish feeding trails and Cost Beneficial analysis.

Institute for Environmental Biotechnology, Rhodes University (EBRU) together with ***Agricultural Research Council (ARC)***

- Cultivation of *G. sulphuraria* will take place on-site at the Department of Ichthyology & Fisheries Science (DIFS), Rhodes University adjacent to the fish farm and utilize fish wastewater as the culture medium.
- Procurement of the *G. sulphuraria* cultivation in ponds is underway, and initiation of set-up and inoculation is scheduled for 2023 after initiation of laboratory-scale seed cultures.

Outlook

The possibility of planning future spin-out research and development projects will be analyzed in great extent especially in areas that will contribute to the transferability of the project results to new aquaculture and feed applications using advanced technologies. To facilitate and complement the exploitation outlook of the results, the project will also make selected non-confidential public knowledge available to all the stakeholders. The use of the new knowledge generated for upskilling and for enriching curricula in European and African education will have a high impact for raising the knowledge base to prepare aquaculture and aquafeed industries for accelerating transition to the environmental-benign, green economy, with the aim of supporting policy makers and regulatory bodies in proper decision making.

We will be happy to update you on the progress and results of this project in the coming months. If you do not wish to be informed about the project, please email daniel.pleissner@ilu-ev.de and you will be removed from the list.

More information about the CLIMAQUA project can be found on these websites
https://www.ilu-ev.de/en/portfolio-items/climaqua/
https://www.foscera.net/en/foscera/Projects/CLIMAQUA.htm

If you have any questions, ideas, or suggestions, please share them with us.

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