



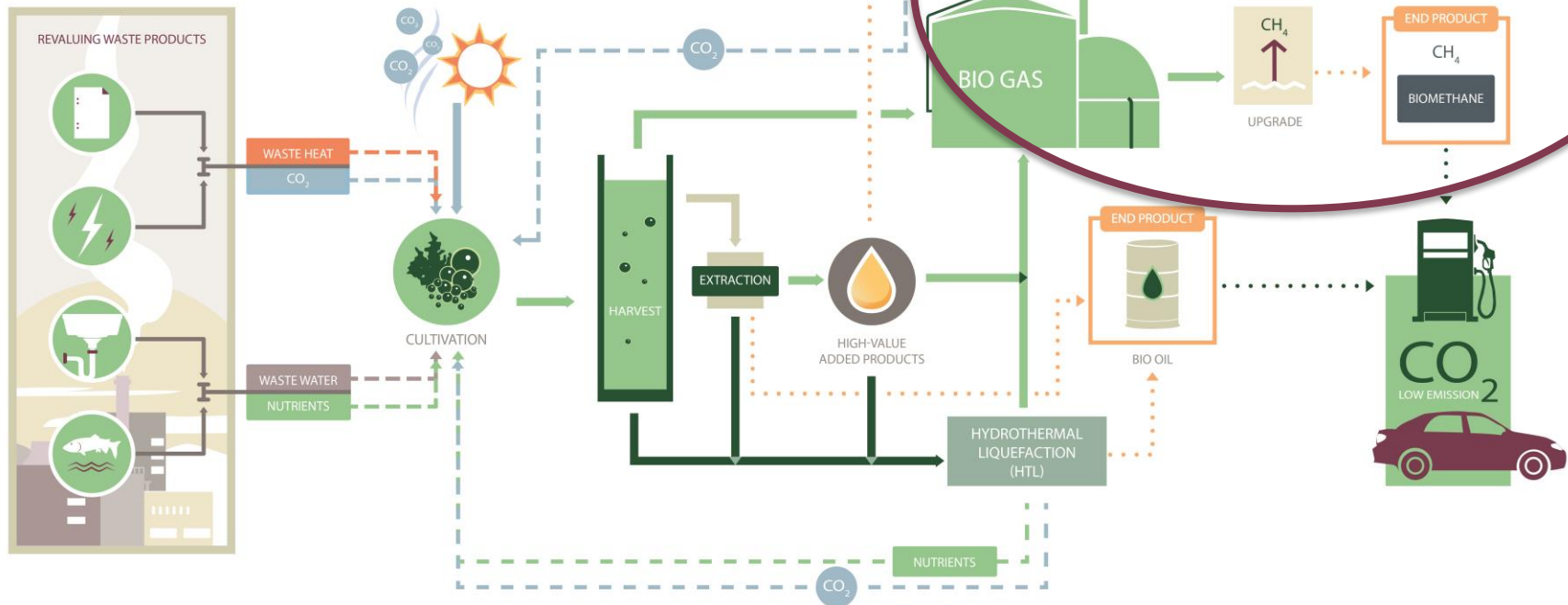
Why Biogas from Algae?

Project Leader Andreas Willfors
12 September 2018



Interreg
Botnia-Atlantica
European Regional Development Fund





PROJECT COURSE

REVALUATION OF WASTE PRODUCTS

CULTIVATION

HARVEST

TRANSFORMATION

SYSTEM ANALYSIS

The role of Novia UAS

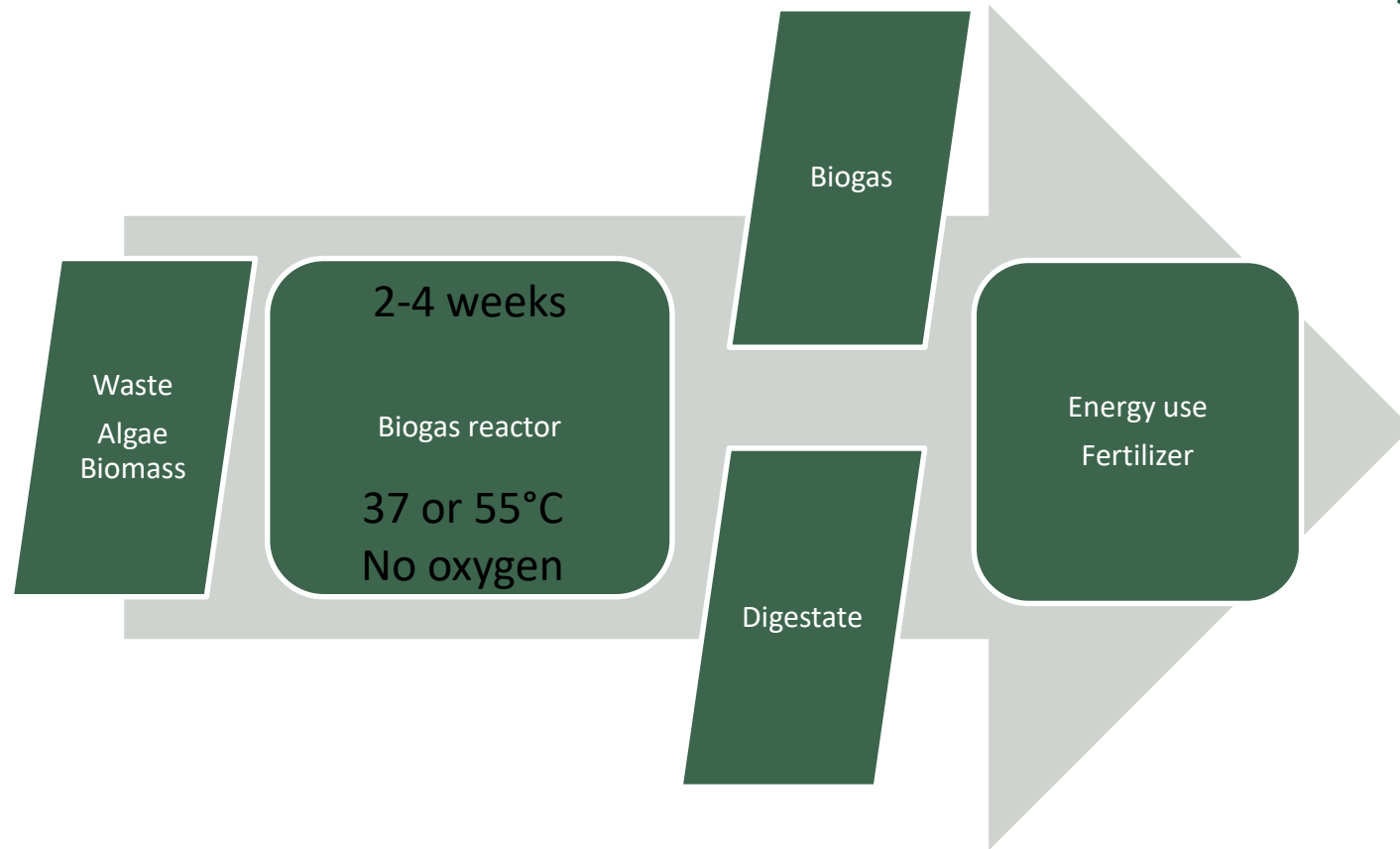


AMPTS II at Novia UAS

Introduction

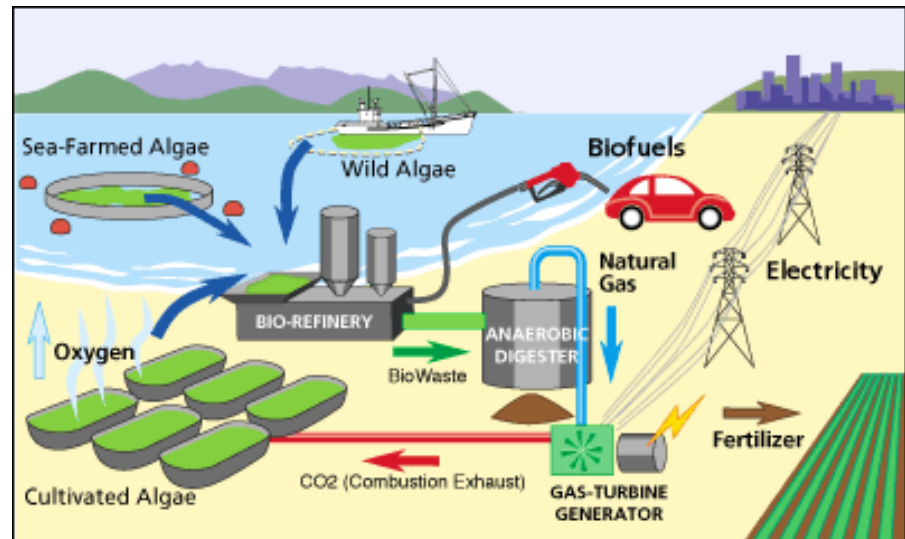
- Biogas is produced through anaerobic digestion
- Approx. 60% methane (CH_4), 40% carbon dioxide (CO_2)
- Many different usages, may need upgrading
- Renewable, waste treatment method
- Production is increasing, but also demand
- Digestate as fertilizer
- This will focus on why (and why not) algae as a substrate – Not the benefits of algae overall

Introduction



Biogas from Algae

- Many products from algae need high purity or only use a fraction, or extensive dewatering – Not biogas!
- Why only biogas? Anaerobic digestion can use the rest of the algae (extracted), or a consortium of algae
- Spare capacity in existing digesters
- Proven technology, demand for the products
- Micro- or macroalgae?



Anstett, Seaweed Biofuel Promotes Island Self-Sustainability, 2014

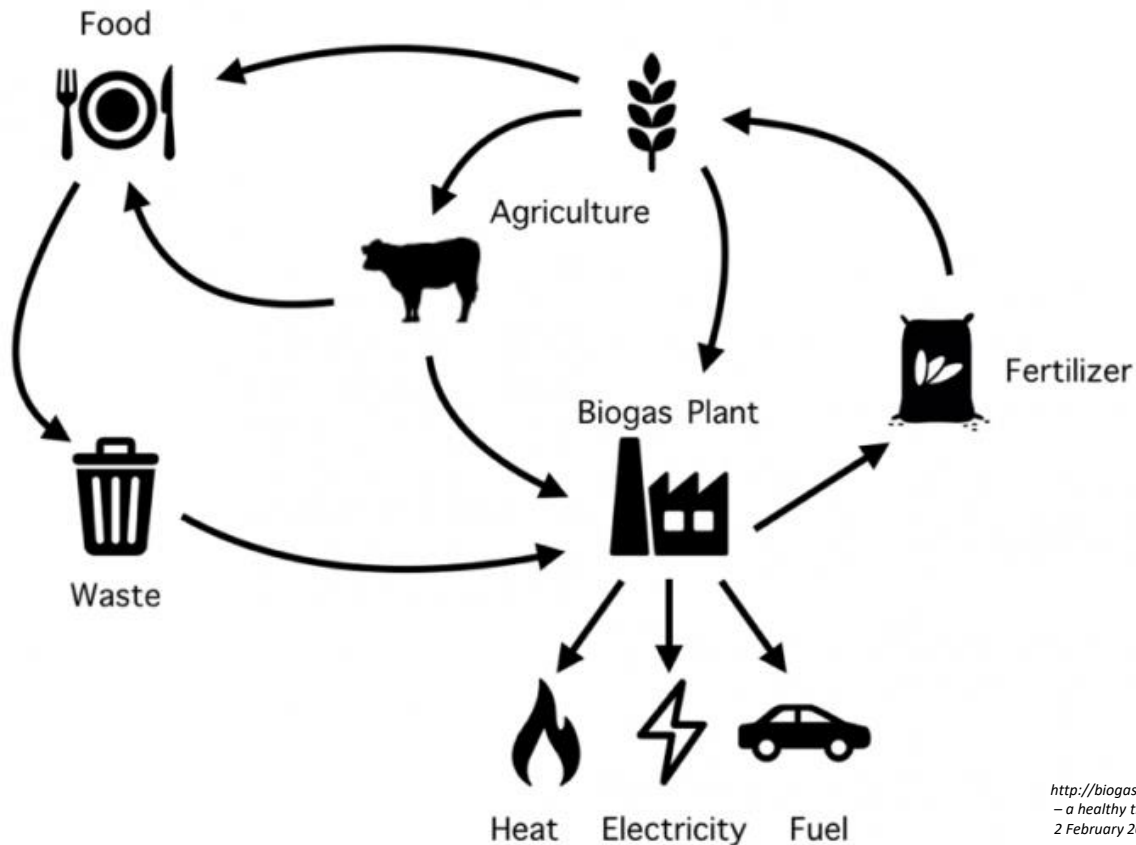
Challenges



- There are usual (biofuel) barriers; financial, technical..
- The composition of algae varies – Difficult to predict
- Based on our results, macroalgae is better for biogas, not as much studied as microalgae
- Pretreatment solution to low BMP of microalgae (?)
- Low C/N ratio of microalgae, inhibition of macro → Mono-digestion unlikely
- Sustainability of large-scale macro unclear
- Digestate content

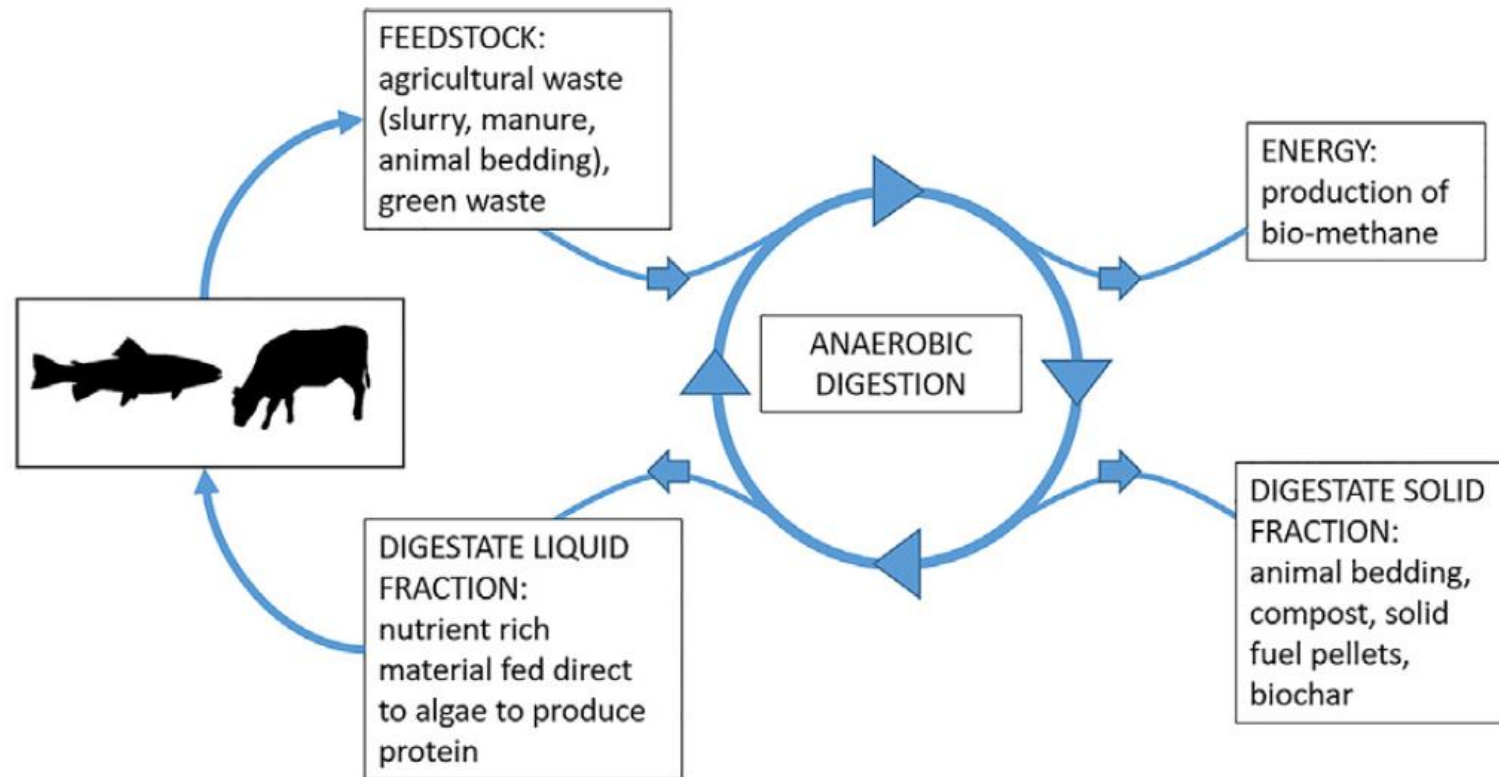
Biogas in a Circular Economy

Closed loop with biogas plant as a link between waste and resources



<http://biogasaction.eu>, Circular Economy
– a healthy transition driven also by Biogas
2 February 2017

Circular Algae and Biogas



Stiles et al., Using microalgae in the circular economy to valorise anaerobic digestate: challenges and opportunities, *Bioresource Technology*, Volume 267, 2018, Pages 732-742

Circular Algae and Biogas

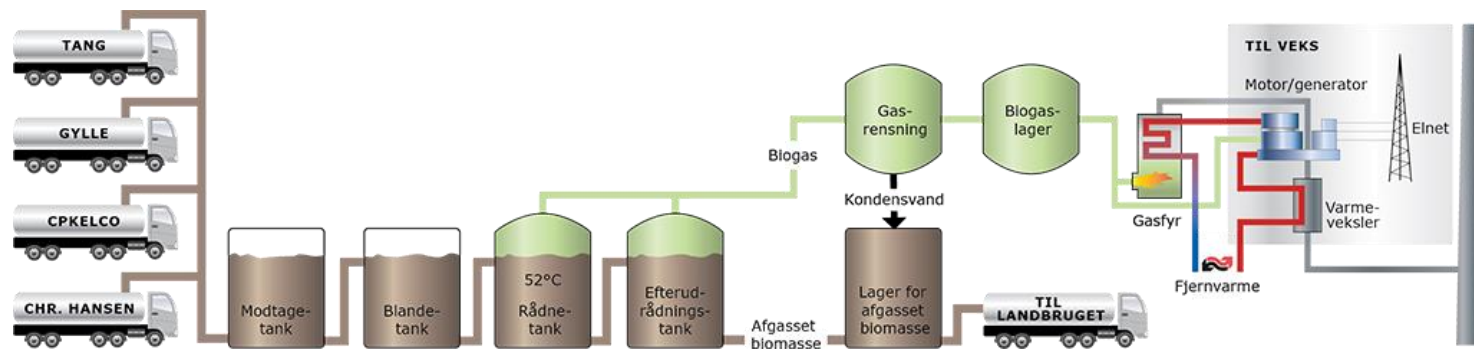


- Many opportunities to recirculate, for example CO₂ in biogas could be used for algae
- Problem with digestate as fertilizer: Finding storage, or enough land close by or other restrictions
- Algae however, could use the digestate throughout the year – In warmer climates. Novia is looking at the energy balance
- Algae instead of soy could increase food security
- The findings of Novia show some barriers – But some are common to most circular systems

Circular Algae and Biogas



- Example of added benefit of biogas and circularity is Solrød BiogaS, who had an odour problem caused by beach cast seaweed
- Wanted to address both the climate issue and the seaweed problem at the beach



<https://solrodbiogas.dk/en/what-is-biogas/>

Conclusion

- Biogas uses waste and local resources, which makes it possible to return nutrients to agriculture
- Algae are turned into biogas already, but in small amounts
- Algae and biogas fit together from the circular economy perspective, as they can recycle nutrients from waste
- Algae could make use the nutrients in digestate also when fertilizing in agriculture is limited
- Energy is important, but food, feed & other uses preferable
 - High-value products focused on for financial barriers – But biogas can use waste from others

www.biofuelregion.se/transalgae

