

Macrofuels: WP3 Biochemical fuel production (WP Leader DLO)

19/01/2016, Kick Off meeting Amsterdam



Project concept

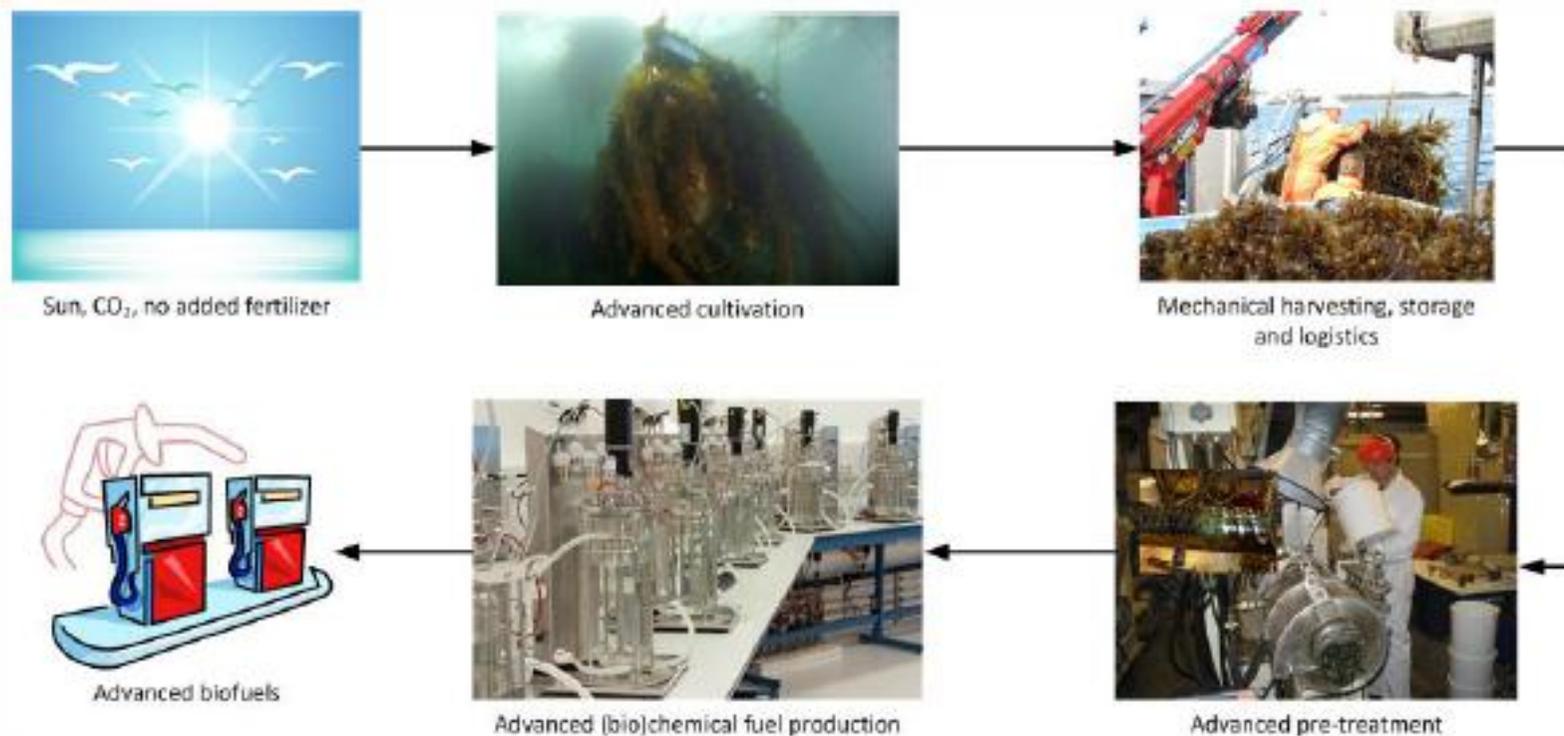
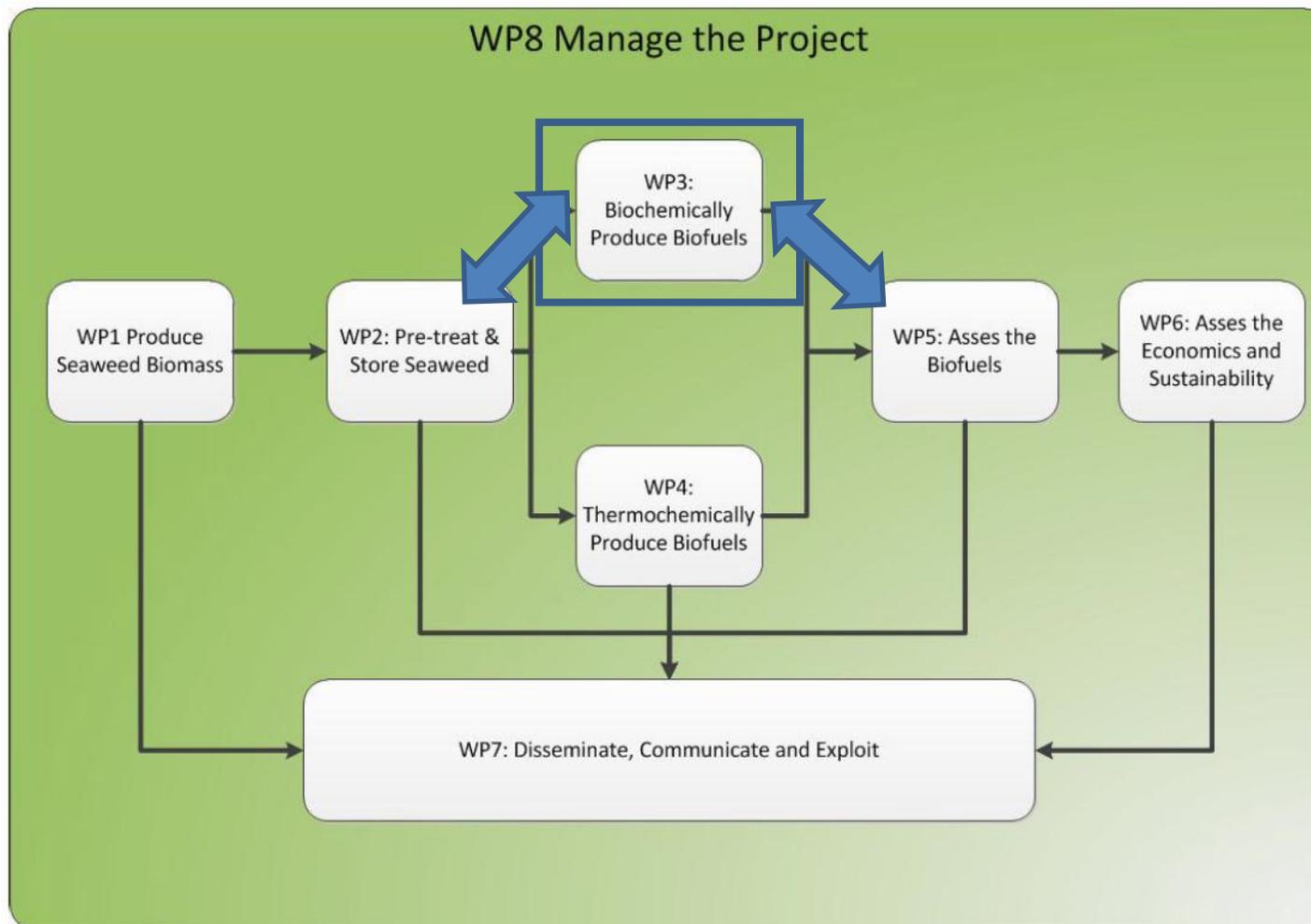


Figure 1: Schematic representation of the MacroFuels envisioned seaweed to biofuels chain.



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WP3: Biochemical fuel production



Objectives:

1. Improved ethanol from seaweed syrups

1.a Conversion of all sugars (C5, C6, Mannitol, uronic acids..)

1.b Improved tolerance to inhibitors (salts, furanics, metals, protein)

1.c Study Simultaneous Saccharification and Fermentation (SSF) vs Separate Hydrolysis and Fermentation (SHF)



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2. Improved Acetone, Butanol, Ethanol (ABE) production from seaweeds

2.a Conversion of all sugars (C5, C6, Mannitol, uronic acids) and organic acids in seaweed syrups into ABE and valuable co-products. Study tolerance and nutrient requirements

2.b Consolidated Bioprocessing of (fractions of) seaweeds. Fermentation and degradation of polymers by one organism. Reduction of enzyme use in the pre-treatment.



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3. Digestion of residues from fractionation and fermentation to biogas

3.a Improved volumetric throughput

3.b Increased salt tolerance

3.c Decrease volatile sulfur production

3.d Effective amino acid processing



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4. Analysis of the residues for evaluation of applications

5. Production of sufficient fuel for benchmarking and blending tests in WP5



Tasks in WP3



T 3.1 Fermentation of seaweed syrups to ethanol by mesophilic organisms (DTI, M1-40)

- 3.1.1 Mesophilic yeast fermentation
- 3.1.2 Thermophilic anaerobacter fermentation
- 3.1.2 Combined process with >4% EtOH titers

T 3.2 Thermophilic anaerobic biorefinery organisms (MATIS, M1-40)

Ethanol production by optimized *Thermoanaerobacterium* strain



Tasks in WP3



T 3.3 Efficient fermentation of seaweed and seaweed fractions to ABE (DLO, M1-40)

3.3.1 Fermentation of hydrolysates to ABE mixes, and other co-products, by *Clostridium* species

3.3.2 Improvement of *Clostridium* for utilisation of laminarin and other polysaccharides in seaweed fractions. Reduce the need of external enzymes in pre-treatment



Tasks in WP3



T 3.4 Anaerobic digestion of seaweed fractions (SAMS, M12-48)

- Including optimization (AD) process
- Improve energy balance of the biofuel processing plants and the overall value chain.
- Achieved by improving fundamental understanding of how methanogens and the other microbes cope with pre-treatments
- Direct comparison of biogas production from residual by-products to fresh seaweed.

T 3.5 Analysis for evaluation of applications of seaweed fractions after biochemical conversion (all above, ECN)



WP3 Teams

DLO : Truus de Vrije, Miriam Budde, Florent Collas, Emil Wolbert,

DTI: Anne-Belinda Bjerre et al

SAMS: Michele Stanley, Angela Hatton, Arlene Ditchfield

MATIS: Guðmundur Óli Hreggviðsson et al

ECN: Jaap van Hal, Wouter Huijgen



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Thank you !

