PROCESSING OF IDEA+ ALGAE BIOMASS HARVESTED DURING DIFFERENT PILOT TRIALS

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Introduction

- During different IDEA+ pilot trials algae biomass was produced that needed to be processed immediately after each harvest (Fig. 1).
- Processing could comprise:
  - Further dewatering of MAF pre-harvested algae by centrifugation
  - Biomass preservation (freezing, freeze-drying)
  - Cell disruption = making algae compounds accessible
  - Fractionation = defatting

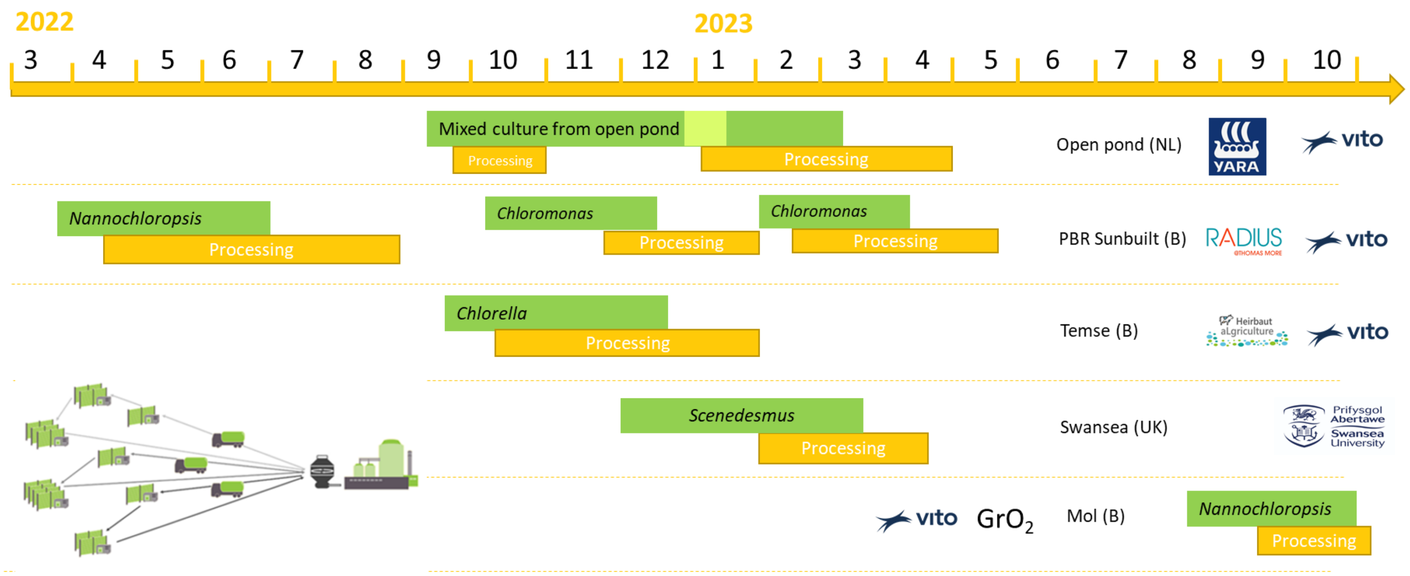

Figure 1: Overview of algae growth pilot trials linked to IDEA+ generating algae biomass that needed processing.

Processing approach

- The produced biomass was transported in (pre-)concentrated form from the growth location for central processing at VITO.
- The processing approach is visualized in Figure 2.

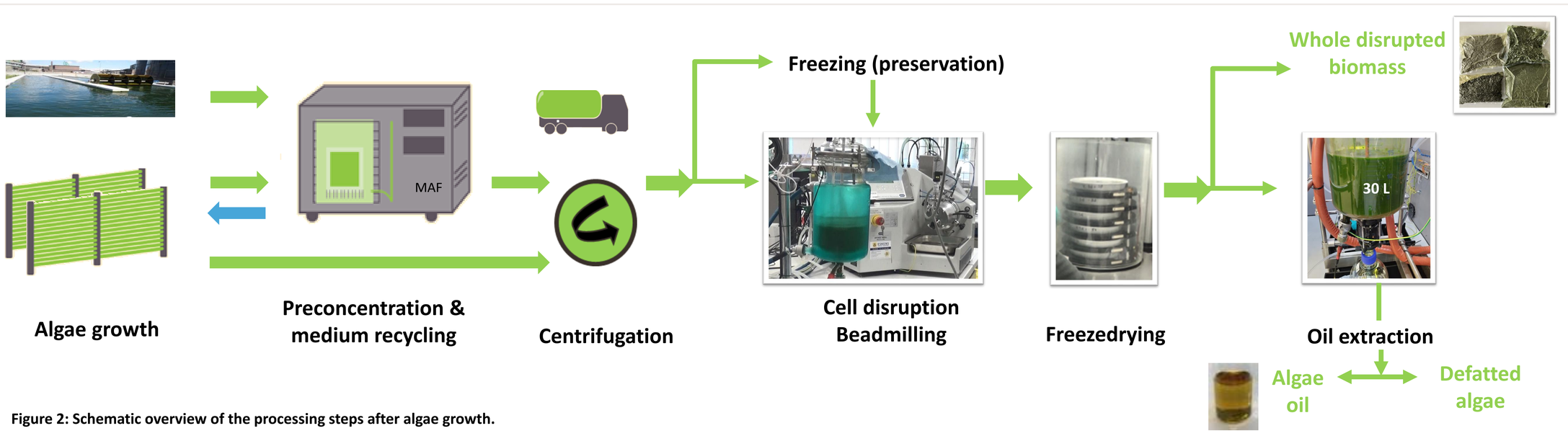

Figure 2: Schematic overview of the processing steps after algae growth.

Results

- In total, more than 1 m³ of concentrated biomass was generated, of which more than 0,8 and 0,9 m³ were beadmilled and freeze-dried, respectively (Table 1).
- Part of the biomass was defatted (4,7 kg) via solvent extraction with recuperation of solvent, generating 0,7 kg algae oil and a partially defatted algae meal (3,6 kg). Defatting efficiencies:
  - *Nannochloropsis*: 69 %
  - *Chlorella*: 58 %
  - *Chloromonas*: 12 % (further process optimization required)
- More than 14 different IDEA+ algae biomass types were generated for chemical characterization (Figure 3, 4 & 5) and application trials.

Table 1: Overview of processing steps and produced biomass for the different algae biomass types.

	Nannochloropsis	Chloromonas	Chlorella	mixed culture	Scenedesmus	Total
Side-stream used for growth	MAF permeate of Process water	MAF permeate of Process water	Recycled CO_2	Process water	Digestate	
Harvested (VCF 1)	11000 L	12200 L	16500 L	244300 L		> 430 m³
MAF pre-concentration	Yes	No	Yes	Yes	No	
After centrifugation	> 68 L	119 L	71 L	651 L	120 L	> 1 m³
Beadmilling	> 65 L	129 L	71 L	475 L	156 L	> 0,8 m³
Freeze-drying	> 65 L	125 L	70 L	500 L	150 L	> 0,9 m³
Dry algae produced	3,8 + 1,7 + 0,35 kg	1,7 + 3,6 kg	4,4 kg	10,5 + 18 kg	1,7 kg	
Oil extraction	Yes	Yes	Yes	No	No	
Oil produced	427 g	60 g	197 g			

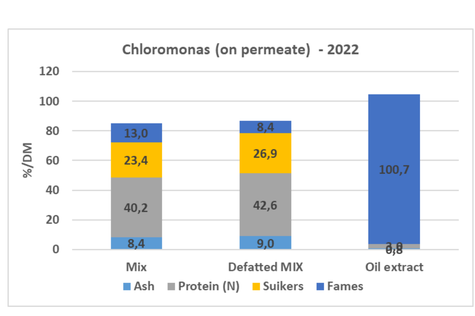

Figure 3: Composition of *Chloromonas* biomass and of its oil extract and defatted fraction

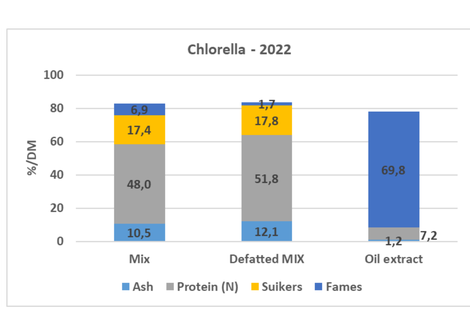

Figure 4: Composition of *Chlorella* biomass and of its oil extract and defatted fraction

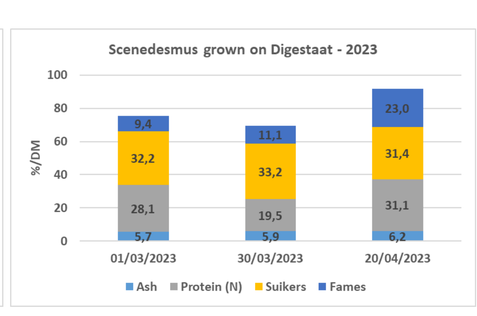

Figure 5: Composition of *Scenedesmus* biomass harvested at different time points. The high viscosity of the biomass complicated the analyses.

IDEA - Implementation and development of economic viable algae-based value chains (NWE639)

Duration: 9/2017 – 10/2021, capitalisation till 12/2023

Website: www.nweurope.eu/IDEA

Lead partner: VITO, Belgium

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