

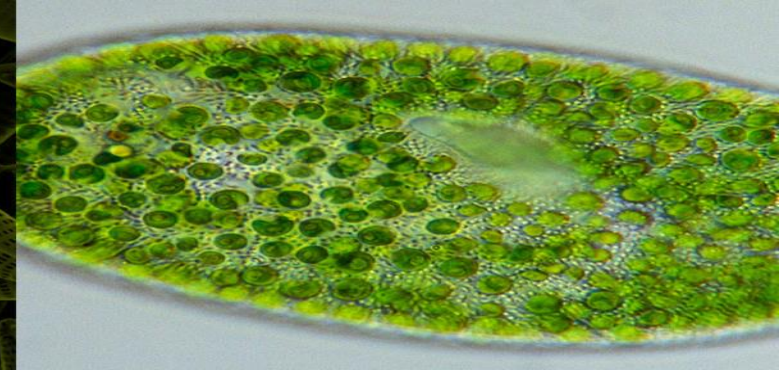
# EnhanceMicroAlgae

## Webinar

### The EMA Decision Support Tool

Dr Claudio Fuentes-Grünewald  
Research Officer  
PI Work Package 7  
Swansea University

July, 2020



## WP7 Action 2

Across different growth platforms (different volume PBR, ponds), different lighting (inc. LED) and nutrient (N vs P-stress) regimes, *Nannochloropsis sp.* and species selected by Atlantic Area stakeholders (likely diatom and/or flagellates), will be grown with multi-parameter logging and frequent sub-sampling for characterization. **“Growth parameters will be used to inform development of a DST, enhanced by biochemical characterization to inform production rate estimates and ensure consistency”.**



Prof. Flynn work at the interface of (experimental) plankton ecophysiology and simulation modelling. Expert on Algal physiology > 170 papers

### Enhancing Microalgal Production

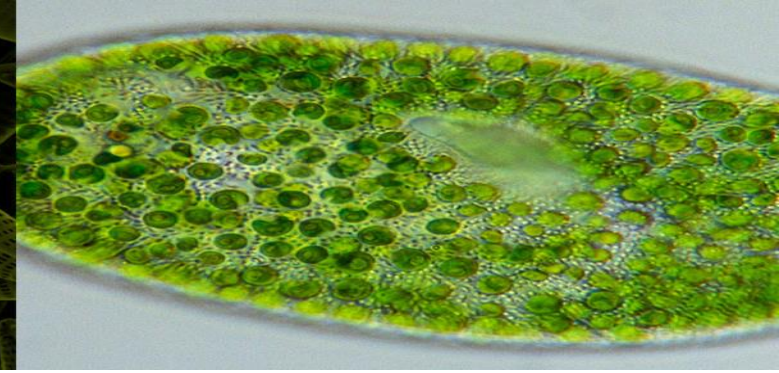
Constructing Decision Support Tools Using System Dynamics Modelling

Kevin J Flynn

Interreg Atlantic Area European Regional Development Fund

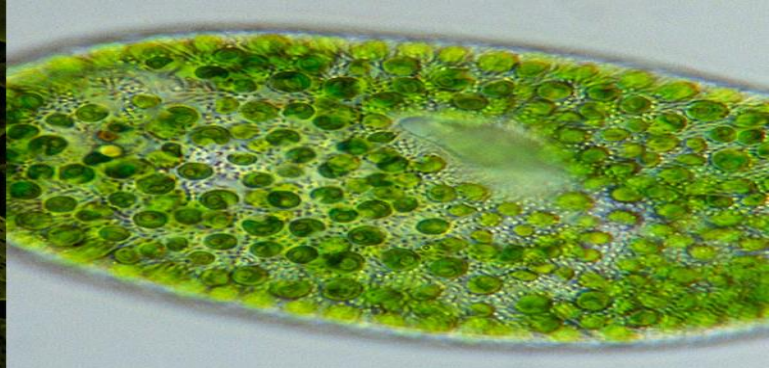
ENHANCE MICROALGAE



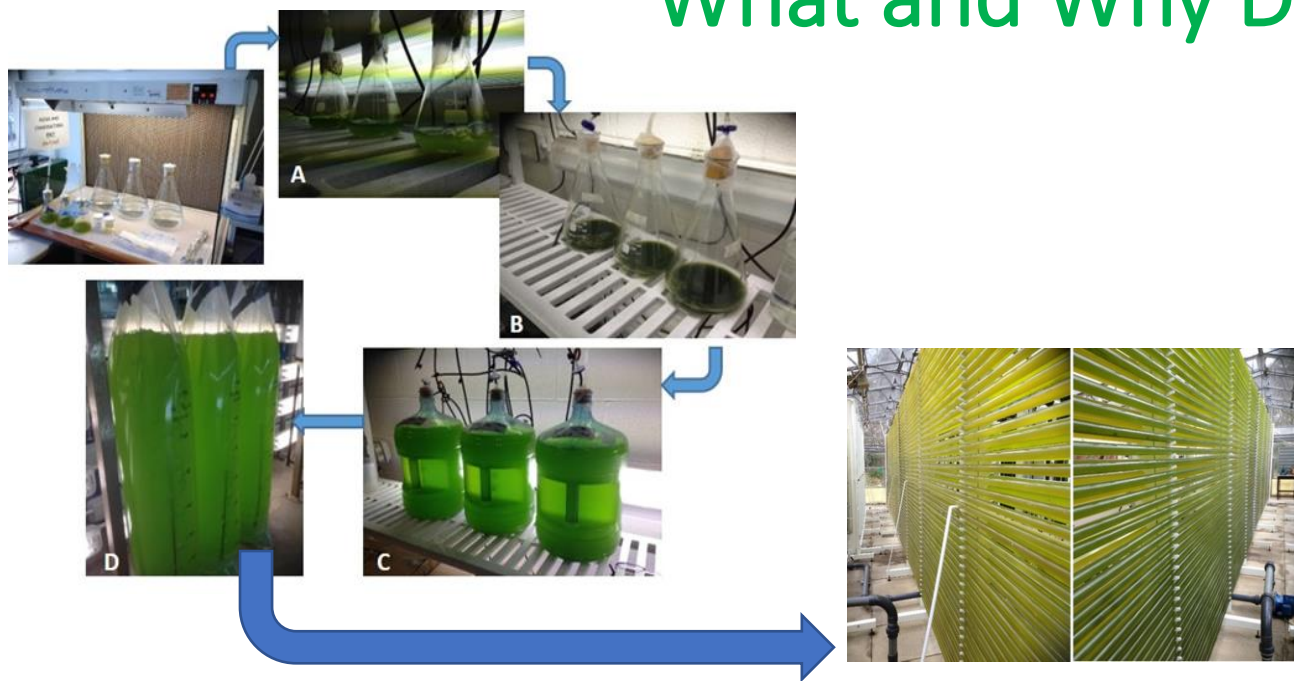


# What and Why DST?!

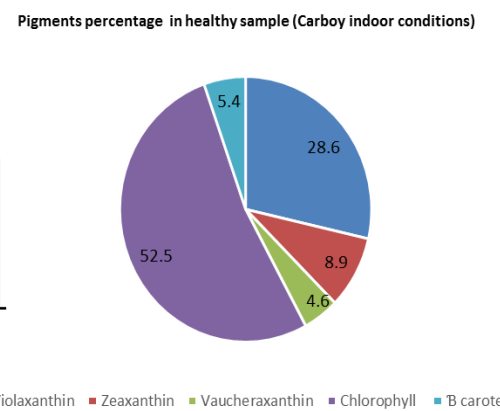
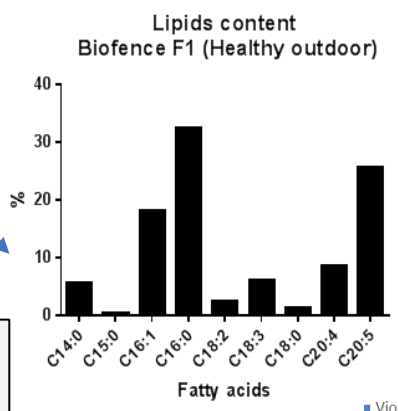
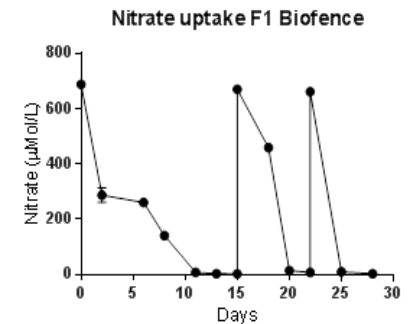
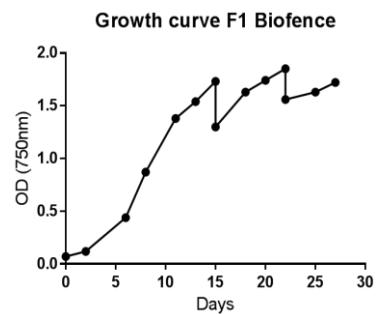
- A computer based simulation description to experiment with
- Real algal growth is slow and expensive to study
- Mistakes are costly
- Simulations are cheap (free) and fast
- Identify bad options quickly
- Concentrate effort on better options
- Select best options for exploration with a real system



# What and Why DST?!

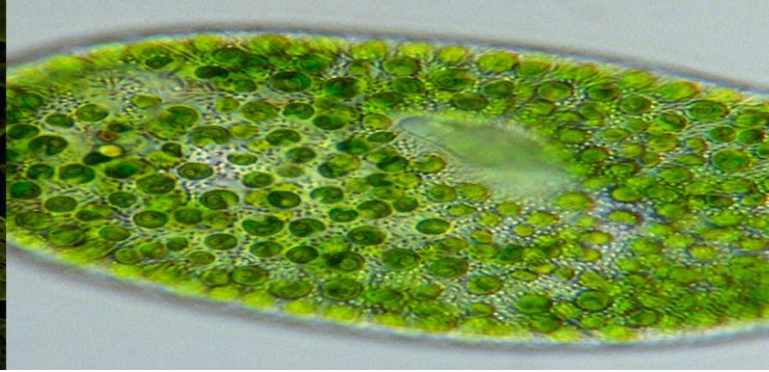


Scale-up process from (A) 250mL flasks, (B) 1L flasks, (C) 20L Carboys, (D) 80L Bags, finally to 800L Biofence cultures



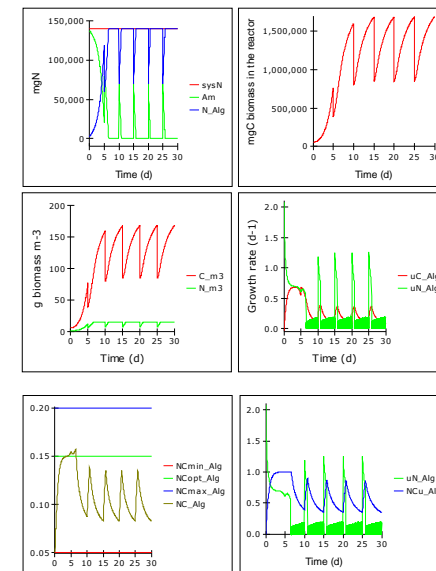
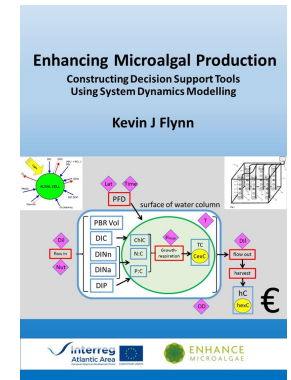
Chemical analysis





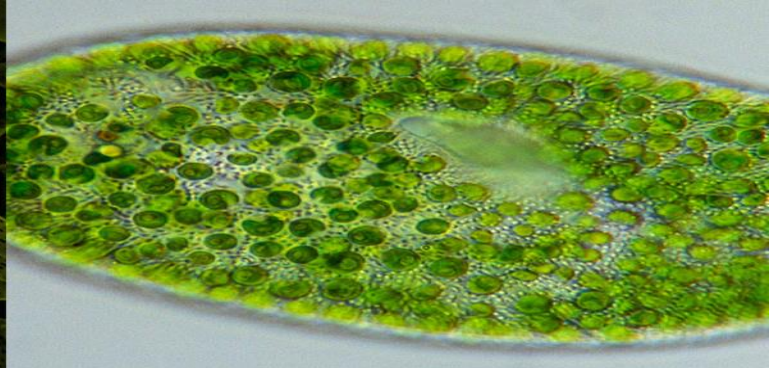
# What does the DST comprise?

- A free e-book on aspects of algal physiology and culturing, with an introduction to the DST
- An introduction (for those who wish it!) on simulation modelling
- Free simulation models for the end-user to use to aid commercial-facing decisions in the growth of microalgae

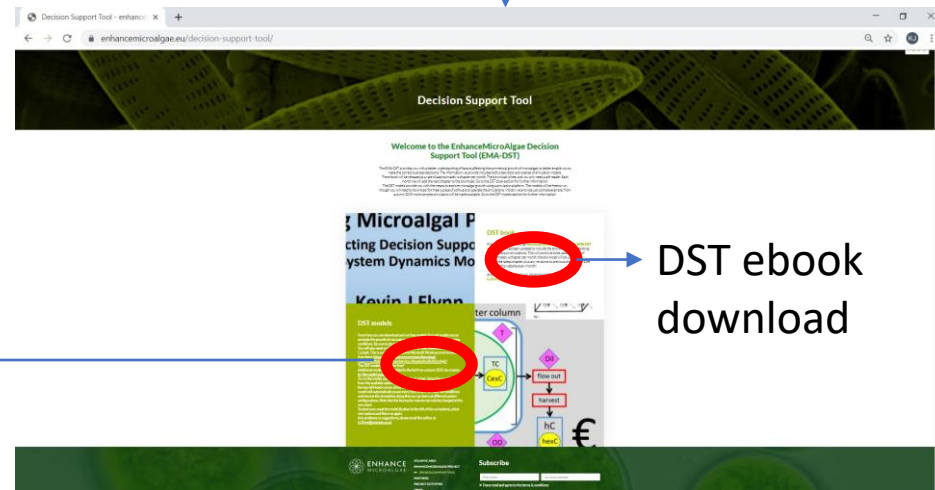
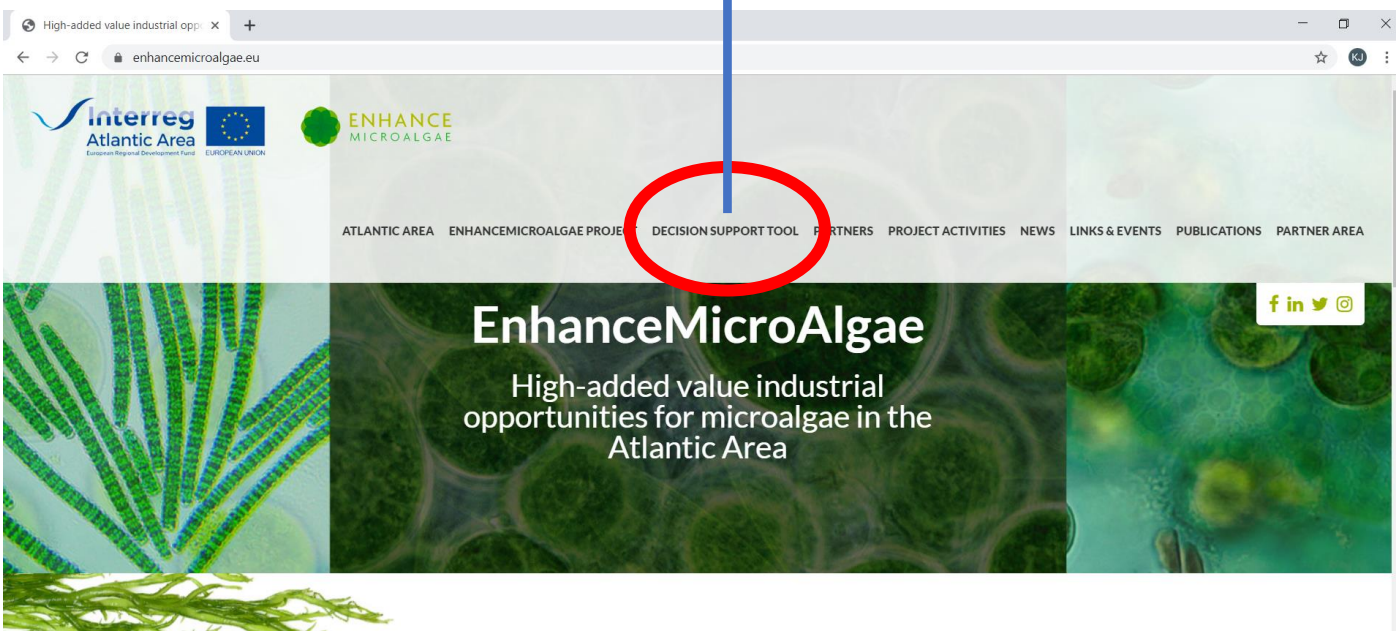


<b>Reactor volume (m3)</b> <input type="text" value="0.50"/> <input type="text" value="1.00"/> <input type="text" value="10.00"/>	<b>Maximum growth rate (d-1)</b> <input type="text" value="0.35"/> <input type="text" value="0.69"/> <input type="text" value="1.39"/>
<b>Optical depth</b> <input type="text" value="Small Bore"/> <input type="text" value="10cm Bore"/> <input type="text" value="Pond"/>	<b>Background dilution (d-1)</b> <input type="text" value="0.00"/> <input type="text" value="0.05"/> <input type="text" value="0.10"/>
<b>Light (PFD; umol m-2 s-1)</b> <input type="text" value="200.00"/> <input type="text" value="500.00"/> <input type="text" value="2,000.00"/>	<b>Harvest frequency (d)</b> <input type="text" value="2.00"/> <input type="text" value="5.00"/> <input type="text" value="10.00"/>
<b>Ammonium concentration</b> <input type="text" value="100uM N"/> <input type="text" value="500uM N"/> <input type="text" value="1000uM N"/>	<b>Harvest proportion</b> <input type="text" value="25%"/> <input type="text" value="50%"/> <input type="text" value="95%"/>





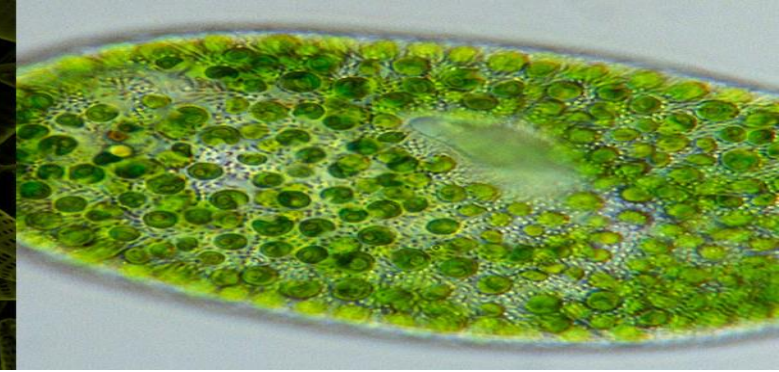
<https://www.enhancemicroalgae.eu/>



Powersim software download

DST ebook download



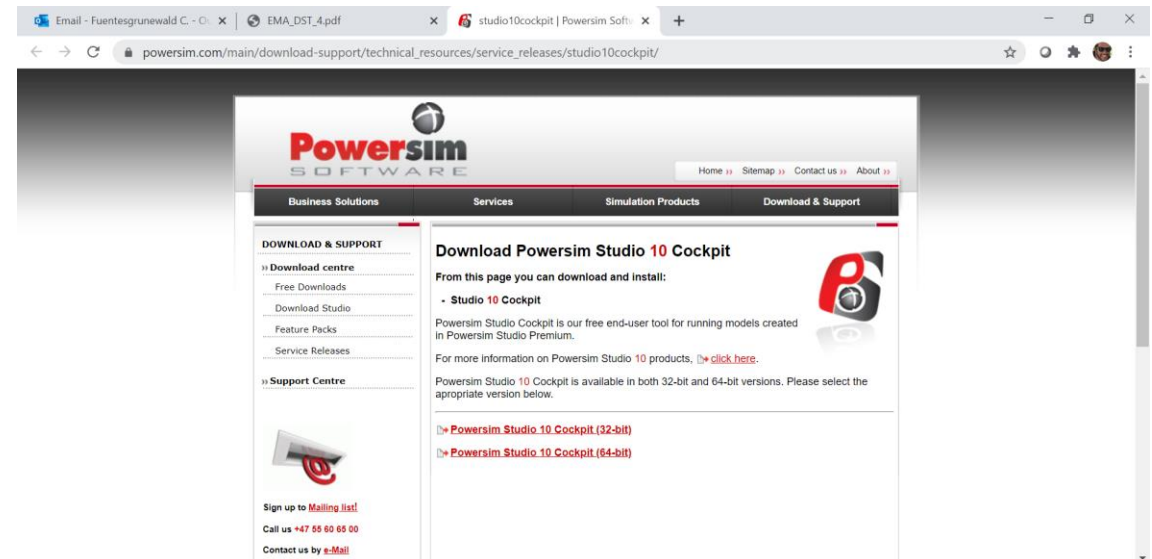
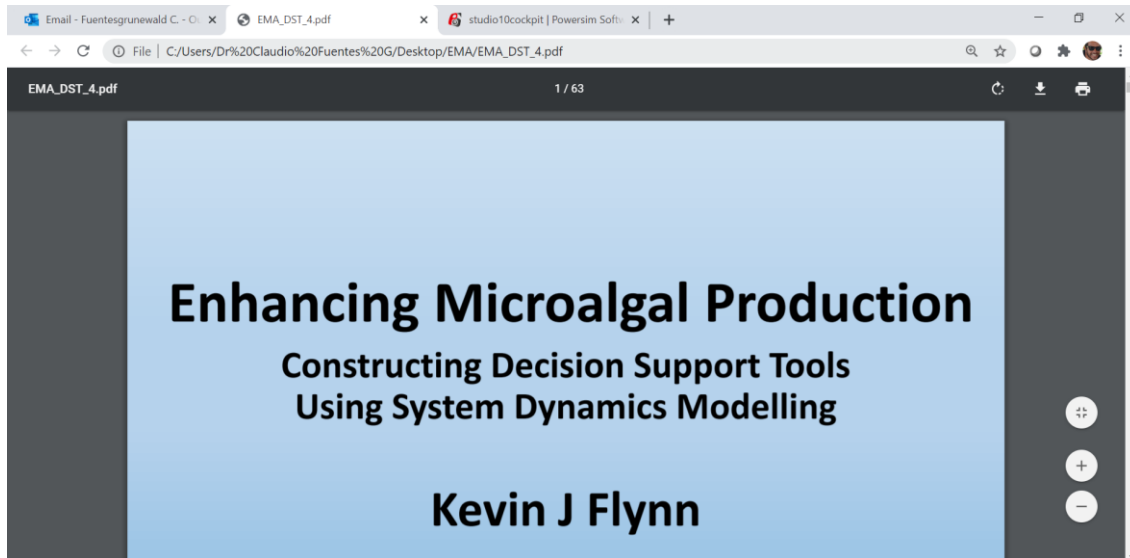


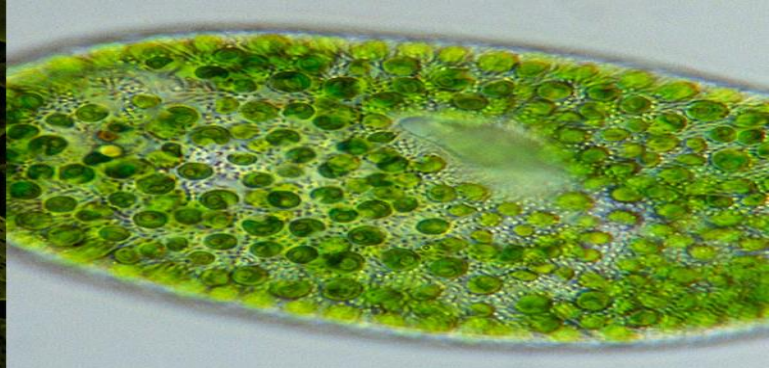
<https://www.enhancemicroalgae.eu/>

## DST book

From the link below, you can [download the latest version of the EMA-DST e-book](#)

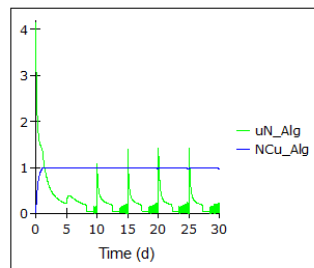
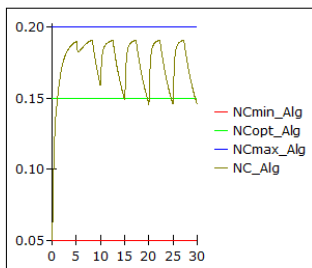
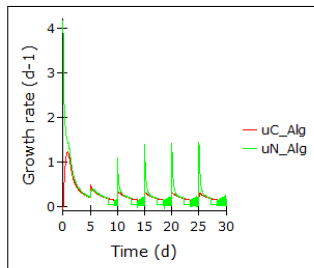
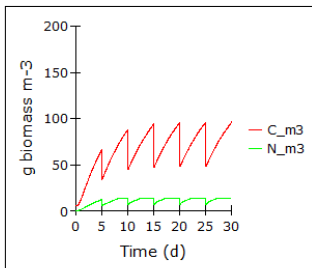
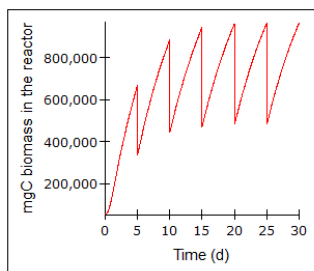
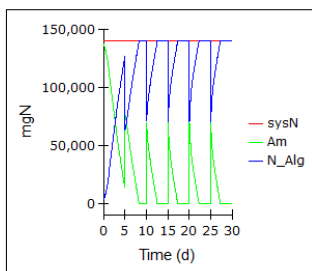
This is available to run in the Microsoft Windows environment, from here: [https://www.powersim.com/main/download-support/technical\\_resources/service\\_releases/studio10cockpit/](https://www.powersim.com/main/download-support/technical_resources/service_releases/studio10cockpit/)





Powersim Simulation Presentation

75%



A low NC\_Alg indicates N-limitation and a high lipid/carbohydrate content.  
A high NC\_Alg indicates a high

**Reactor volume (m3)**

0.50

1.00

10.00

**Background dilution (d-1)**

0.00

0.05

0.10

**Maximum growth rate (d-1)**

0.35

0.69

1.39

**Optical depth**

Small Bore

10cm Bore

Pond

**Harvest frequency (d)**

2.00

5.00

10.00

**Light (PFD; umol m-2 s-1)**

200.00

500.00

2,000.00

**Harvest proportion**

25%

50%

95%

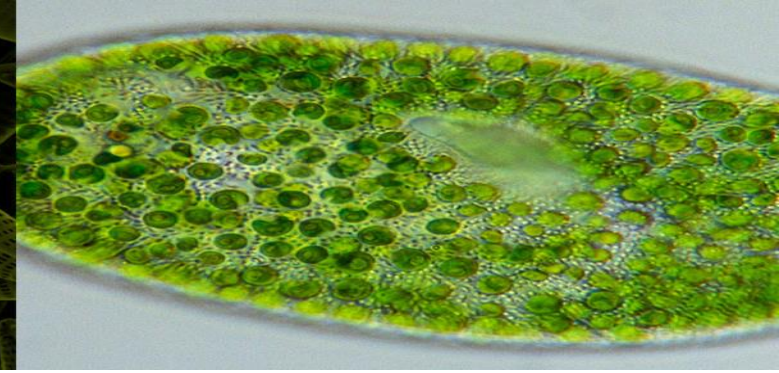
**Ammonium concentration**

100uM N

500uM N

1000uM N





<https://www.enhancemicroalgae.eu/>

# Many thanks!! Questions??

Dr Claudio Fuentes-Grünewald, contact: [c.fuentesgrunewald@swansea.ac.uk](mailto:c.fuentesgrunewald@swansea.ac.uk) Swansea University

DST problems or suggestions, please email the author at [kjfplankton@gmail.com](mailto:kjfplankton@gmail.com)