

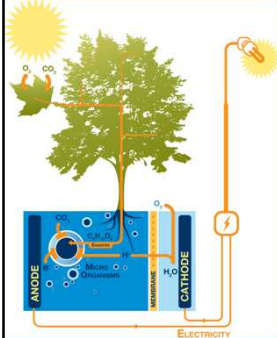
## Planten maken electriciteit & biofuels

Jan Snel, Chris Blok, David Strik<sup>1</sup> en Bert Hamelers<sup>1</sup>  
<sup>1</sup> AFSG - Environmental Technology Group



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## Combination Plant - Microbial Fuel cell (Plant MFC)



- Plant
  - productie van exudaten
- Micro-organismen
  - conversie van exudaten in electriciteit
- Voordelen Plant-MFC
  - hoge opbrengst, korte keten
  - geen competitie met landbouw
  - lage behoefte meststoffen

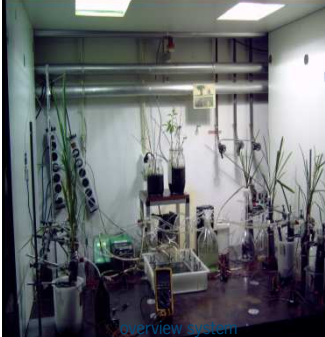
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## SenterNovem NEO 'Planten maken stroom'

- Partners: PRI en WUETE
- Traditionele energie uit biomassa:
  - biomassa via destructieve oogst plantmateriaal
  - lage efficiëntie bioenergieconversie
  - hoge input (kunstmest, arbeid, transport)
  - competitie met voedselproductie
- Doel
  - Proof-of-Principle Plant-MFC concept
- Looptijd: september 2006 - augustus 2007

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## NEO project 'Planten maken stroom'



Plant-MFC systemen


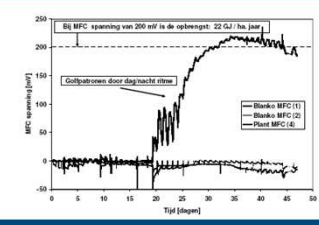
- Terrestrisch
  - Liesgras (*Glyceria maxima*)
- Aquatisch
  - Eendekroos (*Lemna sp.*)

Criterium voor succes

- Output > 4 GJ ha<sup>-1</sup> yr<sup>-1</sup>

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## Test 1: Liesgras (*Glyceria maxima*)

Conclusies

- Productie > 22 GJ ha<sup>-1</sup> jr<sup>-1</sup>
- Doelstelling (4 GJ ha<sup>-1</sup> jr<sup>-1</sup>)

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## EOS-LT project 'Planten maken stroom'



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### EOS-LT project 'Planten maken stroom'



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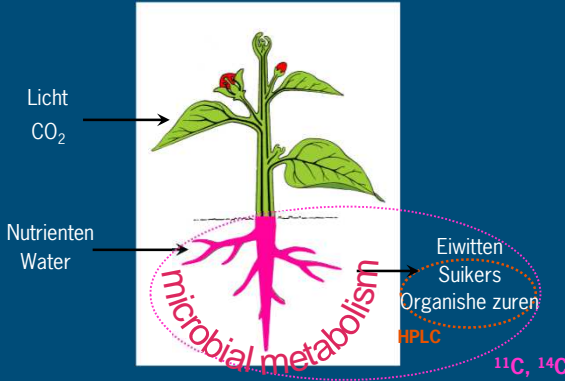
### EU FP7 project 'Plant Power'

René Kuijken, Jan Snel, Leo Marcelis, Harro Bouwmeester,  
David Strik<sup>1</sup> en Bert Hamelers<sup>1</sup>  
<sup>1</sup> AFSG - Environmental Technology Group



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### Het systeem Plant-MFC



Licht  
CO<sub>2</sub>

Nutrienten  
Water

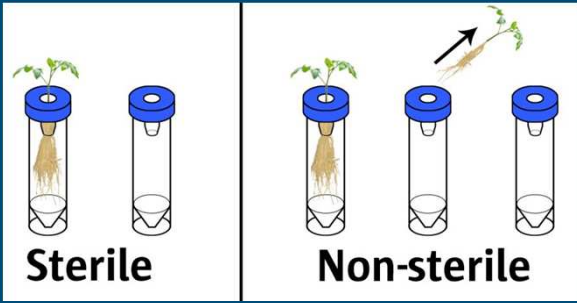
microbial metabolism

Eiwitten  
Suikers  
Organische zuren

HPLC

<sup>11</sup>C, <sup>14</sup>C

### Simpleer systeem



Sterile

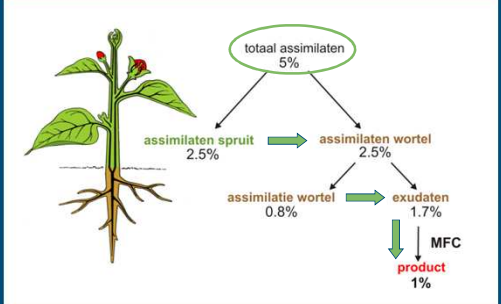
Non-sterile

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### Pilot met tomaat



### Plant-MFC: potentie met huidige technologie



totaal assimilaten 5%

assimilaten spruit 2.5%

assimilaten wortel 2.5%

assimilatie wortel 0.8%

exudaten 1.7%

MFC

product 1%

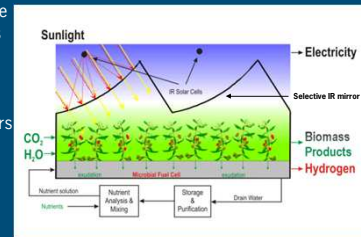
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### Plant-MFC: potentie, maar nog en lange weg



### Greenhouse Bioenergy Production: concept

- Bioenergy from greenhouse
- Supplemental IR solar cells
- High efficiency, high yield
- Excellent infrastructure
- Innovative sector
- Located close to consumers
- Year round production
- Flexible output
  - Hydrogen
  - Electricity
  - Organic compounds
  - Horticultural produce (vegetables/flowers)?



Sustainable production of electricity via IR PV cells, flowers or food in greenhouse and hydrogen production with Crop-MFC in greenhouse from only H<sub>2</sub>O, CO<sub>2</sub> and (sun)light.