

A Fresh Look at the Prospects for Algal Biofuels

Challenging the Raceway Pond Orthodoxy.

Bioenergy Australia Meeting @ CSIRO Canberra
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A Critique of Two Publications

This presentation and discussion arose from a suggestion by Manager, BioEnergy Australia to the author regarding his observations regarding the recent IEA Bioenergy Task 39 paper:

Commercialising Liquid Biofuels from Biomass, authors Al Darzins, Philip Pienkos & Les Edye (2010)

The scope was later expanded to include the related paper that formed part of the IEA Bioenergy Annual Report (2010):

Current Status and Potential for Algal Biofuels Production, authors Jana Hanova, John Benemann, Jim McMillan & Jack Saddler (2011)

Both papers were produced for IEA Task 39, Commercialising Liquid Biofuels from Biomass.

A full copy of my critique will have been distributed to members in advance of this presentation. It is intended that the bulk of the time slot will be allocated to moderated discussion amongst members.

Sev Clarke

The Dominant Paradigm

- Algal raceway ponds are the best option
- A viable algal biofuels industry is decades off
- Wait for GM advances to deliver viability

Currently Accepted Wisdom

- Raceways are much cheaper than bioreactors
- The bigger the raceway, the more economic
- Only salty or waste water are viable water sources
- Site algal biofarms near sources of nutrient CO₂
- Use only autotrophic (photosynthetic) algae for fuel
- Only turbulence can deliver near-optimal light
- Algal co-product markets are likely to be swamped
- Concentrate on high-lipid algae and GM methods
- At best, algal biofuels will replace 5% of transport fuel

Current Implicit Assumptions

- A focus on algal lipid productivity is essential
- Co-products tend to be incidental sideshows
- But do consider biorefineries for algal biomass
- Let others think about the big picture of how an algal biofuels industry will relate to others
- Throwing money at problems always helps
- An algal biofuel industry needs subsidisation+
- Algaculture is, by definition, sustainable

15 Assumptions Challenged

1. Land that slopes at 2-5% is raceway-suitable
2. Very large raceways are cheap and durable
3. Seawater is the optimal, available water source
4. Using seawater is cheap
5. Siting biofarms near big CO₂ emitters is best
6. Sourcing CO₂ will remain quite costly and most cannot be used
7. Raceway ponds are better than closed bioreactors

Assumption Challenges (cont.)

8. Darzins' base case is a good start
9. High-lipid, algal strains are best for biofuel production
10. Algal productivity is improved best by GM
11. Dewatering algae is necessarily expensive
12. Co-products of algaculture are sideshows
13. Only consider autotrophic algae for biofuel
14. Extremophile algae are best
15. Algaculture is, by definition, sustainable

Moderated Discussion

- Takeaway message: ***Forget raceways – use low-cost, mass-produced bioreactors***
- Questions and Clarifications
- The Challenger Challenged
- Intellectual and Practical Contributions
- Moderator closes discussion and summarizes
- Where to from here? Note BEA/IEA/member action?
- Members wishing to read of one possible solution to the algal biofuels problem list their names, organizations and email addresses to receive a copy
- Close