Commercialisation of Kelp Cultivation

Is there any money to be made?

Could it add value to coastal communities?

Could it help the Fishing industry?

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Questions

- China?
- Minimum Viable Profitable Size?
  - Hatchery
  - Farm
  - Downstream process (AD & Bio-refinery)
- Near shore sites – stakeholders?
- High Value Products?
  - Quality of Raw Material
  - Mix & Yield
Going off shore

- More Exposed – impact on moorings & lines
- More potential sites
- Higher costs
- Fewer Stakeholder issues
**Knowns**
- Hatchery
- Long Line operation
- Yields per metre
- Anaerobic Digestion

**Unknowns**
- Market for by-products
- Route to Market
- Pricing
- Volumes needed
- Quality
- Capital & Operating costs
- Farm, Shore Ops & AD
- Bio-refining ???

**Grants?**
- Innovate UK
- Horizon 2020 etc
What Does a Venture Capitalist look for?

- Numbers that are properly presented….accurate figures on past performance and credible projections.
- The deal must make lots of money.
- The acid test of a deal is management – honest; experience; achievements; high energy levels; motivated.
- The situation should be unique.
- The proposed Venture should be orientated towards the market.
- The deal MUST have an exit.

This is too early stage & high risk for a VC.
What Does a Business Angel look for?

- 30% Strength of Management Team.
- 25% Size of Opportunity of specific market for company’s product
- 15% Competitive Landscape
- 10% What Sales Channels are in place?
- 10% What Stage of business is the company?
- 10% Funding required …. 
- 30 x return over 7 year period

The deal MUST have an exit.

**Deal Killers:** Too early stage OR to small a potential market
## Exhibit 7.3 Global value of seaweed products per annum (McHugh, 2003)

<table>
<thead>
<tr>
<th>PRODUCT</th>
<th>VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Human Food</strong> (Nori, aonori, kombu, wakame, etc.)</td>
<td>$5 billion</td>
</tr>
<tr>
<td><strong>Algal hydrocolloids</strong></td>
<td></td>
</tr>
<tr>
<td>Agar (Food ingredient, pharmaceutical, biological/microbiological)</td>
<td>$132 million</td>
</tr>
<tr>
<td>Alginate (Textile printing, food additive, pharmaceutical, medical)</td>
<td>$213 million</td>
</tr>
<tr>
<td>Carrageenan (Food additive, pet food, toothpaste)</td>
<td>$240 million</td>
</tr>
<tr>
<td><strong>Other uses of seaweeds</strong></td>
<td></td>
</tr>
<tr>
<td>Fertilizers and conditioners</td>
<td>$5 million</td>
</tr>
<tr>
<td>Animal Feed</td>
<td>$5 million</td>
</tr>
<tr>
<td><strong>Macroalgal Biofuels</strong></td>
<td>Negligible</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>$5.5-6 BILLION</strong></td>
</tr>
</tbody>
</table>
Farming Kelp—is it commercially viable?

Global perspective
- 14.7M T produced 6% wild 94% farmed
- Top 7 countries are all in Asia = 99.95% of farmed R of Ireland
- Turnover €18M, Directly employs (FTEs) 185 & Kelp is insignificant < 1% of 0.025 MT Tonnes Annual Harvest

Comparative Labour Rates
- UK min. wage rate is £6.50 v. Shenzhen Factory worker c £1.32 p.h. Adjacent Hong Kong - Population 15M
Kelp By-Products - Value added Chain

- Traditionally in Ireland – fertiliser – soil enhancer – animal feed

- High Quality food for human consumption

  “reduce the amount of fat available for absorption by the body by around 75 per cent”

- Alginate extract

  Gelling Agent in: Jellies, soup, ice cream, thickening drinks

  Pharma i.e. Biodol Gaviscon

- Mannitol

  Food: Sweetener, coating for dried fruit, mints, hard sweets, or chewing gums
• AD – uneconomic for Kelp only.
• Balance feed of animal or fish waste to get best C:N ratio
• Potential option within Seaweed/shell fish aquaculture
• Potential option within Bio-Refining.
Exhibit 6.1 Schematic of the potential conversion routes for whole algae into biofuels
Barriers - Why is nobody doing it today?

Primary Production issues - *What are the Yields?*
- Labour cost – scale needed – mechanisation – Tonnes per man hour
- Crop yields (temp, tidal range, wave action, currents, salinity, depth, nutrients, opacity, epiphytes, & time of harvest)
- Setting up and operating a Kelp Hatchery, seeding, transport
- Long lines in sheltered waters versus off-shore solution
- Operational harvesting experience using machinery
- Impact & cost of on shore storage and time delay on yield
- Sizing of: hatchery; no of farms; farm size; shore based facilities.

For other stages: **Capital, Operating costs, & Yields are unknown**

Initial Processing – Stage of Washing, Milling, and Drying

Manufacture of intermediate products – unknown

Anaerobic Digestion – known domain but needs **a bio-refining solution**
Road Map – How to get there?

Primary Production
- Hatchery
  - Grow-out Farm
  - Bio refining with Anaerobic Digestion
    - Biogas
    - Fertiliser
    - Other Product

Renewable Energy
- Initial Processing
  - Wash/Mill/Dry
    - (stabilise)
    - Food Sector
      - Process Dry product
      - High tech milling
      - Chemical Extraction

Target Process in future
- Manufacture
  - Liquid Products
    - (stabilise)
    - Make Low Value added Products
      - Cosmetics /food
      - Healthcare
    - Other Product

Food & Pharma ingredients
Solution - Incremental, low risk steps

- Step 1 - Build Operational Business Model for
  - Grow-out Farm
  - Seaweed Hatchery (QUB at Portaferry is a Research facility)
  - Bio refining option

- Step 2 – Stress Test Business Model assumptions & Sensitivity

- Step 3 – De-risk for stakeholders: design of corporate structure, use of R & D funding, and external capital

- Step 4 – Make an investment decision for Primary Production at minimum viable scale.

- Lead time – 6 months
Competition

- Indirect Competitors – By-products produced by China
  - Alginate – USD $8-$10 per kg
  - Manitol – USD $3 per kg
  - Furan Dicarboxlyic Acid – Pharma price USD 1,430 per kg
  - Bio Gas price
  - Bio Diesel price

- Direct Competition (or collaboration)
  - FMC Rockland or CP Kelco
  - Sweden – Operational Algae farm – Biogas
  - Norway – Algae to bio-crude
Next steps – Getting Feasibility Study done

- Are you interested in this potential business area?
  - Marine sector – Fishing / aquaculture
  - Shore facilities for Storage and primary downstream processing.
  - Developing associated markets for by-products.

Any questions?

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