Food Innovation Gateways

Industrial Expectations from New Technologies

Henry Lyons

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Summary

• Overview of innovation and technology transfer
• Expected benefits
• Barriers and negatives
• Marine food and ingredients - challenges
• Primary food production
• Future
The 20 Most Significant Inventions in the History of Food and Drink -1 to 10

1. Refrigeration
2. Pasteurization / sterilization
3. Canning
4. The oven
5. Irrigation
6. Threshing machine/combine harvester
7. Baking
8. Selective breeding / strains
9. Grinding / milling
10. The plough
The 20 Most Significant Inventions in the History of Food and Drink – 11 to 20

11. Fermentation
12. The fishing net
13. Crop rotation
14. The pot
15. The knife
16. Eating utensils
17. The cork
18. The barrel
19. The microwave oven
20. Frying
Sources of new technology

- Universities/ Third Level Institutes
- State food research centres
- Manufacturers
- Patents, trade magazines
- Trade shows, Exhibitions
- Technology transfer, brokers
- Converging technologies
Sources of new technology-2

• Word-of-mouth contact with peers
• Internal / In house
• Internet
• Acquisitions
• Serendipity
• Salesmen!
Expectations - general

• New product(s)
• New/improved process(es)
• Competitive advantage
• Economics : Energy, labour, increased capacity
• Quality
• Environment
• Regulations
Expectations - Food Industry

- Natural, Minimal processing, organic
- Green technology
- Integrated process(es)/waste minimisation
- Recycling
- Craft, artisan
- Back to basics
Barriers

- Risks, fear of failure
- Long term fit – not a fad or flash in the pan
- Unforeseen implications,
- Costs esp capital
- IP, confidentiality
- Competition
- Regulations
Barriers cont’d

• Planning
• Environmental issues
• Timescale
• Commercial vs academic outcomes
• Focus
Marine Algae Sector

• Biomass in the oceans
• Traditionally: Food in Far East, Alginate, agar and carrageenan
• Attention/Focus now on nutraceuticals, functional foods, supplements and pharma products
• Unique biopolymers; alginate, fucoidan, laminarin, ulvan
• Oligosaccharides
Industry

• Industry – up to now one component extracted and rest dumped as waste
• New approach. Biorefinery /integrated manufacture
• Research in Ireland/ EU.
• Nutramara
• Irish resource
Challenges

• Natural raw material of variable composition
• Composition is function of species, location, season etc
• Complex biopolymers-cell walls & intracellular sites
• Degree of polymerisation
• Often found in combined forms e.g. glycoproteins
• Polyphenols bound to proteins --- enzyme inhibition
• Extraction processes may alter composition
Structure and Bioactivity

• Biopolymers
• Linear and branched, linkages (eg glucose)
• Oligosaccharides eg beta glucans
• Degree of polymerisation
• Degree of sulphation for fucoidan
• Synergies
Processing Technologies

- Drying, milling and micronising
- Solvent extraction (Vary pH, T, P, Time)
- Cryocrushing
- Differential pressure – cell bursting
- Ensilation
New technologies being tested

- Bioprocessing
- Microwave
- Ultrasonics
- High Pressure Processing
- Supercritical fluid extraction
- Expectations
Chitin and Chitosan

- Crustacean shells – crab and shrimp
- Second most abundant biopolymer
- Estimate 10 trillion tonnes
- Applications – chitosan and glucosamine
- Challenges -- oligochitosans
- Expectations
- Munster University research
## Primary Food Production

<table>
<thead>
<tr>
<th>World Population</th>
<th>Arable Land Per Capita</th>
<th>Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>6 Billion</strong></td>
<td>2,500 sqm</td>
<td></td>
</tr>
<tr>
<td><strong>9 Billion</strong></td>
<td>1,650 sqm</td>
<td>Failure to meet increasing global food demand.</td>
</tr>
</tbody>
</table>

**2000**
- 6 Billion
- 2,500 sqm

**2050**
- 9 Billion
- 1,650 sqm

Source: FAOSTAT

- Decline in crop yield annual growth rate.
- Reduced arable per capita.
- Climate disruption on the rise.
- Rising global food demand.
- Failure to meet increasing global food demand.
The Challenge
Growers “Tool Box”

- Fertilizers
- Pesticides
- Biostimulants

Enabling Technology

DEGREE OF PRODUCTIVITY

DEGREE OF CROP PROTECTION
Some Potential Solutions

Precision agriculture
Digital technology, Big data etc
GM technologies
Natural Plant Protection Products and Biostimulants using bioactive oligosaccharides and peptides derived from:
• Marine algae
• Crustacean, Yeast and other food wastes
Go raibh maith agaibh

Thank You
LITTLE SAMPHIRE ISLAND

SEAWEED