



Development of the Agricultural Biomaterials Industry in Ontario: Identifying Investment Opportunities

Aung Oo (Western Sarnia-Lambton Research Park)
&
Alfons Weersink (University of Guelph)

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Background

A vibrant biomaterials sector could

- Increase demand for crops in Ontario (minor)
- Revitalize manufacturing industries
- Create rural development opportunities
- Reduce the environmental footprint of industry



Purpose

- Identify the agricultural biomaterials with the most promising commercialization potential in Ontario

Scope limited to

- A set of biomaterials
- Biomass sources from Ontario
- Auto, construction and consumer product sectors



Biomaterials Considered

1. Bioplastics and biopolymers

PLA, PET

2. Biofoams and biorubbers

Woodbridge seat cushions for Ford

3. Structural biocomposites

replacement for glassfibre composites- hemp

4. Non-structural biocomposites

auto sector is major market

5. Fibreboards

construction and furniture are major markets

Factors Affecting Commercialization of Biomaterials

1. Feedstock Compatibility
2. Technology Maturity
3. Profitability
4. Economic Development Potential
5. Substitute Availability
6. Niche Market Potential
7. Regulatory & Institutional Support
8. Existing Value Chain/ Infrastructure



1. Feedstock Compatibility

- Sufficient biomass (crop residue or dedicated biomass crop) can be supplied for biomaterial industry provided appropriate incentives
- Depends on markets being established; not on ability to produce the material



2. Technology Maturity

- Is technology at R&D stage, demonstration phase, or commercialized?
- Investors expect higher returns for biomaterials with unproven performance (or only at small scale)



3. Profitability

- Will it be profitable within 5 years of initial investment?

- Profitability depends on
 - Production costs,
 - Pricing power,
 - Competition.



4. Development Potential

- Will the biomaterial industry
 - Create jobs?
 - Enhance competitiveness of other components of supply chain?

- Attractiveness increases if development occurs in desired locations (i.e. rural areas)



5. Competition from Substitutes

- How do productions costs compare to alternatives?- Key factor
- Relative costs depend on market conditions
 - Natural gas lowers cost of recycled plastics
 - Low oil prices decreases attractiveness of replacements made without fossil fuels



6. Niche Market Existence

- Does bioproduct have to compete with conventional products in commoditized markets?
- A distinct product increases potential demand growth and pricing power

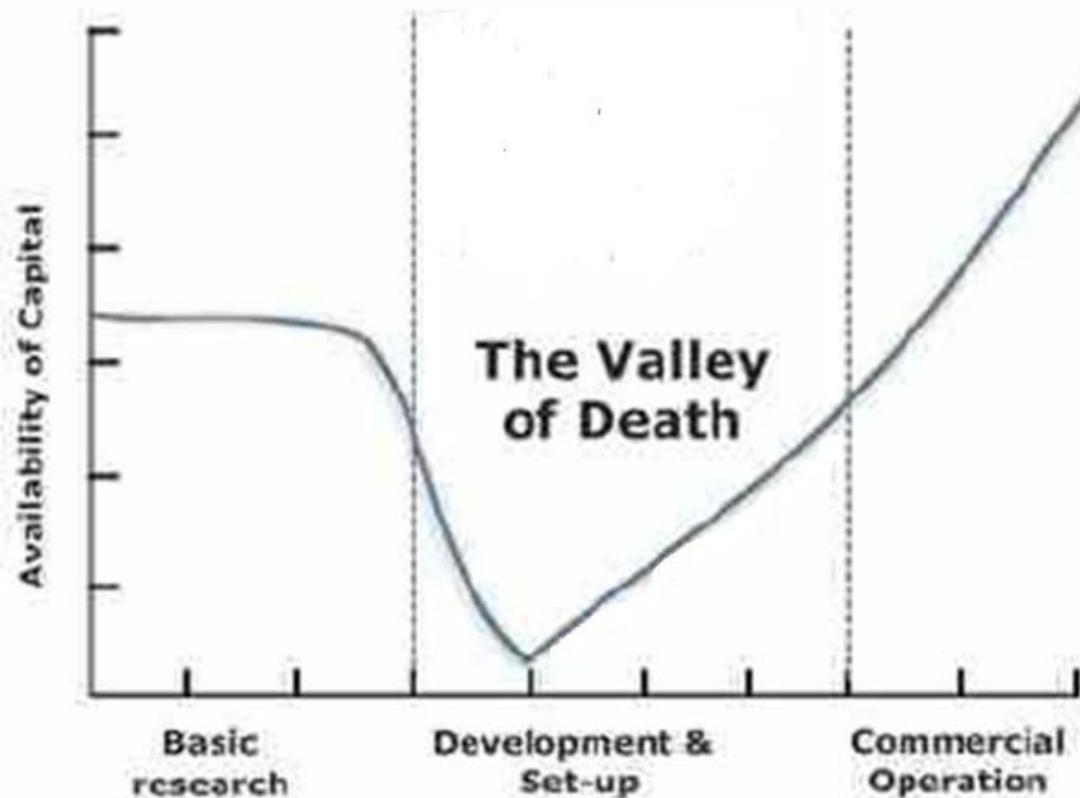


7. Institutional Support

- Regulatory initiatives can provide support to an infant industry
 - i.e. ethanol mandates helped create the current sector
 - But same support negatively affected biochemical sector
- Innovation ecosystem support
- Affects the ease of doing business
 - Regulatory approval process cited as a major burden facing Canadian bioproduct firms



The “Valley of Death” for a New Innovation



Source: Dammer and Carus, 2014



8. Existing Value Chain

- Establishment cost lowered if bioproduct can be incorporated into existing infrastructure
 - i.e. BioAmber leveraged an existing value chain
- Development of a new value chain for biomaterials could take time



Development Potential of Biomaterial Sector for Ontario

Biomaterials	Technology Development Status	Market Development Status	Competitive Edge of Manufacturing in Ontario	Total Score
Bioplastics & Biopolymers	3	2	1	6
Biofoams & Biorubbers	3	2	2	7
Biocomposites (Structural)	2	1	1	4
Biocomposites (Non-Structural)	4	2	3	9
Fibreboards	4	2	3	9

1-least favourable, 5-most favourable



Specific Biomaterial Product Evaluation

Non-structural Biocomposites

- Swithgrass/miscanthus flower pots
- Wheat straw car door panels

Fibreboard

- Corn stover construction panels

Biofillers

- Wheat straw/biomass crop insulation
- Residue as packaging material



Role of Government?

Market-Push Strategies

- Public funding
- Skilled workforce development
- R&D
- Infrastructure development

Market-Pull Strategies

- Cap-and-trade/ carbon tax
- Labeling and consumer awareness
- Public procurement



Thoughts from ISBBB

**(International Symposium on Bioplastics,
Biocomposites, & Biorefining)**

Growth in symposium

- Significant resources into renewables

Examples

1. IGPC

- Profitable “biorefinery”

2. Nature Works- Ingeo

- 10 years ago: Bioplastics = biodegradable
- Currently: Bioplastics = plastics



Summary

Most promising areas for developing an agricultural-based biomaterial industry in Ontario are:

Non-structural biocomposites
Fibreboards

Why

- Technology developed
- Significant market potential, (construction)
- Large biomass feedstock requirement
- Local manufacturing due to logistics



Summary

Development of any biomaterial sector would benefit from coordinated efforts across governments

- Consistent definition of bioproducts
- Area of focus
 - US- pharmaceutical,
 - EU- agr-based bioproducts
- Development of an innovation ecosystem

