Innovation in the Canadian Agri-Food Sector

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Overview

- Definitions, Dimensions and Process
- Innovation and Policy
- Case Study
- The Future
Innovation

“The introduction of something new”

“Something that deviates from established doctrine or practice… differs from existing forms”
Dimensions of Innovation

- Two main categories
  - Technological
    » Product/Service
    » Process
  - Organizational

- Dimensions not independent – varying combinations of all aspects

- Measured along a gradient
Dimensions – Technological Type & Degree of Change

Types of Innovation

Product
- Product line extension
- Branded organic products
- New Cancer Drugs
- Genetically Engineered Crops

Product/Process
- Enterprise Software Systems
- Genomic Research
- GM crops on farms
- E-commerce applications
- Reengineering

Process
- Process modification
- Incremental
- Radical
Dimensions - Organizational Degree of Internalization and Timing

Organizational Change and Innovation

Network

Supply Chain Management

Co-developed technology platform

E-commerce applications

Biotechnology commercialization

Internal

Total Quality Management

Web based

New process technology

Timing relative to Product Process Innovation:

Managerial Innovation

Managerial Adaptation

Precedes

Simultaneous

Follows
Innovation Process

- Innovation models - evolved from linear, technology push models to more fluid, evolutionary models
  - Networks of innovation
  - Feedback loops between different activities
  - Market pull as well as technology push
The Innovation Process
Linear Development Model

Scanning

Assessment & Selection

R & D

Development

Outputs

Diffusion
Innovation Sphere of Influence

Interested Partners
Customers, Supply Chain Partners, Network Partners

Environment
Government, Competition, Social and Educational Factors

Scanning
R &D
Assessment & Selection
Development
Outputs
Diffusion / Outcomes

Assessment & Selection
Development
Outputs
Diffusion / Outcomes

R &D
Assessment & Selection
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Outputs
Diffusion / Outcomes

Scanning
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Diffusion / Outcomes

Environment
Government, Competition, Social and Educational Factors

Innovation Sphere of Influence
National Systems of Innovation

- Lundvall, 1992
- Includes institutions, organizations and policies which impact a nation’s innovative activities and their ability to capture the benefits of those activities
- Evidence that even in a global environment, national policies matter
Innovation and Policy

- **Objective** - Improve well-being of citizens through economic and social policy
- **Innovation** is one contributor to economic performance
- **Governments** want to increase economic impact of innovation - not just innovation for innovation’s sake.
**Progression of Policy Emphasis**

- **Fiscal & Monetary Policy – 70-80’s**
  - Focus = National Economies
  - Create the national conditions that enable industry and organizational success

- **Competitiveness Policy – 90’s**
  - Focus = Industries
  - Create the industry conditions that enable organizational success

- **Innovation Policy – 00’s**
  - Focus = Organizations/Networks
  - Support internal/network strategy processes to create foundations for success
### Canadian Incentives to Innovate

**OECD 1999 7 Innovation Indicators for G7**

<table>
<thead>
<tr>
<th>Measure</th>
<th>1999 Standing</th>
<th>Growth</th>
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<tbody>
<tr>
<td>External patent applications</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Human Capital Devoted to R&amp;D</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Business Funded Expenditure on R&amp;D</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>R&amp;D Intensity</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>Technology Balance of Payments</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>National Patent Applications</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Government R&amp;D Expenditure</td>
<td>7</td>
<td>3</td>
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</tbody>
</table>
Policies and Points of Impact

Interested Partners
Customers, Supply Chain Partners, Network Partners

Environment
Government, Competition, Social and Educational Factors

Scanning
Technical/market Evaluation
Assessment & Selection

R & D
Funding, Taxation, Direct R&D

Cluster Formation, Funding
Development
Outputs

Technical Assistance, Taxation on Capital Spending
Diffusion/Outcomes

IP Strategies
Trade, competition policies

Education and Training Strategies
Technical Assistance, Taxation on Capital Spending
Funding, Taxation, Direct R&D

Environment
Government, Competition, Social and Educational Factors
Policy and Innovation Systems

- Policy decisions impact the general innovation system
  - IP, education, investment
- They can also target specific components or activities of the system
  - tend to be technology focused
Policy Impacts on New Technology

- **Idea Generation – R&D**  *mid- 1990’s*
  - Created at U. of Toronto
  - Funded by National Science Research Council

- **Transfer out of University**
  - Encouraged by University policy
  - Licensed to small diagnostic firm
  - R&D funding by firm – refundable tax credit

- **Patents initiated**  *1998*

- **Search for partners through Agri-food Quality Cluster**  *1999*
Industry R&D

- FONA - Hiring supported by Industrial Research Fellowship 2000
- FONA scientists located at U of T
- Development research supported by grants and R&D taxation support

- Funding secured from firm partners
- Application partners sought – partner in food and environment – both provided funding
- Canadian VC funding environment and technology crash eliminated access to venture capital
Sale to Technology Partner

- 2001 – FONA sold to instrumentation partner
  - Virtek Vision International Inc
  - Facilitated by taxation laws

- Virtek/FONA Development
  - Supported by R&D taxation laws
  - Continuing relationship with U. of T. research team
  - Reach forward to application partners – driven partially by funding opportunities
    - Applications in environmental testing and genomics
    - Separate funding initiatives, partners and applications - common core
<table>
<thead>
<tr>
<th>Technology component</th>
<th>Innovation</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Fibers and Chemistry</em></td>
<td>Radical, incremental dyes</td>
<td>FONA, U. of T.</td>
</tr>
<tr>
<td><em>Laser Reader</em></td>
<td>Incremental to ChipReader</td>
<td>Virtek, contract scientists</td>
</tr>
<tr>
<td><em>Sample preparation</em></td>
<td>Incremental to existing kits, Radical</td>
<td>FONA, Virtek, micro-fluidics partner &amp; testing lab partners</td>
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<tr>
<td><em>Application development</em></td>
<td>Incremental in target selection</td>
<td>FONA/Virtek and testing partners</td>
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<tr>
<td><em>Diffusion to testing labs</em></td>
<td>Radical, organizational</td>
<td>Distribution partner, customers</td>
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</table>
Dimensions – Product/Process and Incremental/Radical

Type of Innovation

Product

Product/Process

Process

Incremental

Radical

ChipReader

DNA Fibres

Dye Chemistries

Sample Prep.
Application Development

Testing Process
Innovation and Organizations
- Timing and Degree of Internalization

Organizational Change and Innovation

Timing Relative To Product Process Innovation:

Precedes
Managerial Innovation

Simultaneous
Managerial Innovation

Follows
Managerial Adaptation

Network

Internal

Application development partnerships

Biotech unit spin-out

Testing in water treatment plants
Conclusions

- Innovation is complex activity requiring internal and external resources
- Issues around managing knowledge transfer between organizations
- Support policies differ for
  - innovation leadership vs diffusion
  - organizational vs technological
  - different industry segments and levels of the supply chain
  - different competitive priorities
- Innovation process can be learned – how do we transfer what we learn
Future for Agri-Food Innovation Policy in Canada

- Canadian White Paper on Innovation
- National Forum on Innovation Management in Canada – Nov. 2002
- Agribusiness Input – Workshop in September
  - Identify priority areas
  - Identify special needs for agri-food
  - Set research agenda