The Future of Crop Research in Canada - Options and Consequences

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Key Points

• High returns ↔ Underinvestment
• There are many options to increase funding that have been tested here and elsewhere
• Intellectual property rights change a public good to a toll good stimulating private investment and potentially creating anti-commons/fragmentation and pricing/incentive issues
• let’s understand where each path to increased funding will lead and choose the best combination of options to address the under-investment issue
Crop Total Factor Productivity Western Canada
1940-2004
Average Annual Growth in TFP in Western Canada

Source: Stewart (2006)
Crop Variety Yield Index 1960-2006

Source: Calculated from crop variety trials and area surveys
Share of Crop Receipts

Cumulative Share of Crop Receipts

- Other Crops
- Canola
- Corn
- Soybeans
- Barley
- Wheat

Year

Share of Crop Receipts
- 90%
- 100%
- 70%
- 80%
- 90%
- 40%
- 50%
- 60%
- 20%
- 30%
- 40%
- 0%

Total investment in Plant R&D (2007, $165 million)
Existing crop research funding

Public funding

Royalties & seed sales

Levies & check-offs
Sources for increased research funding

- Public funding
- Royalties & seed sales
- Levies & check-offs
Increased public funding for research?

- Perception by some that ag is old with low rates of return
  - Continued benefit cost analysis is useful
- even if governments know the rates of return are high:
  - discretionary $ are short-many non-ag demands
  - politically, short term concerns dominate long term thinking – i.e. easy to forget the objective is to the drain the swamp
  - There are other ag issues (environment, food safety, food quality) closer to the hearts of the general public that divert agricultural research resources away from crop research
  - There are some private funding alternatives
  - History speaks for itself ...expenditures have declined
Increasing research through levies

- **Economically levies make sense**
  - Costs and benefits align the incentives for research
  - Cheaper than tax dollars
  - Industry voice improves governance
  - Non-refundable levies reduce the public good problem
  - Can add research and price competition

- **Politically they require producer support**
  - Individual choice is cherished by some producers
  - In Canada, check-offs are collected through marketing legislation, which is a shared fed-prov jurisdiction.
  - Ability increase is limited without a strong drive by producers and governments
  - Commitment by government to match would help
Increased research funding through royalties and seed sales

• This is an important source of research funding where intellectual property is protected, allowing owners to capture the value from their innovations

• Can be increased by:
  – stronger IPRs, patents, end point royalties, PBRs
  – hybrid technologies

- Attractive to MNE but can also be a source of revenue for public/producer research organisations
Can we rely only on royalties?

• Most areas of research still lack complete property rights and will be somewhat neglected by private industry

• A research industry that uses knowledge (i.e., a toll good) as an input has economies of size and is a *natural monopoly*

• If there are many separate owners of IP required for an innovation they may never be combined – anti-commons issue

• Maybe a mixed strategy works best so public can address missing markets and the presence producer can address market power issues
2.0 Other Roads Taken- Examples of Private Research in Innovation systems

• There are many different examples of how other countries and other crop sectors have incorporated private research in the innovation system.
Canadian Canola Innovation System

• Very successful innovation system
• Now Monsanto, Bayer Crop Science, Cargill, Dow Agri-Science, and Pioneer Hybrid
• Hybrid varieties complete IPRs ($40 + per acre per year technology costs)
• Of approximately $600M in gross revenue about $40M is reinvested in research
• AAFC/ NRC etc. still support trait development $15-20M per year. Producers fund agronomic research
• Freedom to operate, knowledge sharing is limited
• market size and research fragmentation are issues
Australian Crop Research - GRDC

- GRDC 1% research levy across all crops
- Matched by Government up to .5%
- GRDC has become the primary research organisation
- Producer and industry reps manage the GRDC
Canadian and Australian Levies as a Percentage of Farm Cash Receipts

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Canada</th>
<th>Australia</th>
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</thead>
<tbody>
<tr>
<td>Cereals</td>
<td>1.0%</td>
<td>0.8%</td>
</tr>
<tr>
<td>Pulses</td>
<td>0.8%</td>
<td>0.4%</td>
</tr>
<tr>
<td>Canola</td>
<td>0.6%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Canary Seed</td>
<td>0.2%</td>
<td>0.6%</td>
</tr>
<tr>
<td>Oats</td>
<td>0.0%</td>
<td>0.8%</td>
</tr>
</tbody>
</table>
Australian Crop Research- EPRs

- End point royalties go to variety owners each time crop is grown-similar to hybrids.
- Each owner sets a different rates.
- The rates have gone from about $1 per tonne produced to about $3 per tonne over the past 5 years.
- Currently about 2.5% (1.5 %levy +1 EPR %) of gross revenue for research- this will grow over time –
- GRDC involved in variety development for smaller crops
- GRDC no longer commercializing wheat –focus is on germplasm
- GRDC invested in the seed industry through partnerships
InterGrain – very interesting

• Joint venture with GRDC/State of W. Australia
• Objectives
  – To provide the Australian grains industry with access to elite varieties that will enable growers (and in particular growers in WA) to compete effectively in domestic and international markets.
  – To provide a business-like, market driven approach with a mix of government, industry and commercial funding and ownership, that is profitable and ultimately self-funding.
Wheat EPRs in France

• A end point royalty of 0.5 Euro/t for farm saved wheat seed. 85% goes to variety owners but some (15%) for general research and variety testing

• Uniform same rate across wheat varieties—this keeps EPRs simple to administer

• Negotiated 5 year agreements signed by producer organisations- producers are giving up the right to save seed for this agreement
Sask Pulse Growers

- Non-refundable levy @ 1% of sales
- Very successful and growing research program
- Very little MNE presence in Pulses
- Rapid growth in pulse yield and area
- Producers maintain cheap access to seed
- SPG control “their” varieties
- Intellectual property is managed for producer interests
3.0 Wheat and smaller crops: Options for public and levy research

• Currently these crops are very dependant on public and levy based funding- limited IPRs
• Research is performed primarily in public organisations
• IP and locally adapted germplasm is “owned” by public organisations
• MNE investment is very limited- few partnerships – so access to their IP is very limited
Key Considerations/Components of Change

1. Getting enough investment in innovation activities
   – Addressing market failures due to non-excludability
2. Putting the right pieces of IP together
   – Locally adapted germplasm
   – International public and private IP
3. Getting prices and incentives right
   – Vehicles for commercialization
   – Market power with concentrated ownership
4. Minimizing transactions costs throughout
5. The distribution of benefits and costs
   – This depends on perspective
Outcomes of not taking action

• Underfunding would persist for some time
• MNEs would not “rush in” but may enter if the means to protect IPRs develop. They will find ways.
• MNE may demand that AAFC stop commercializing varieties in return for making investments in Canada
• Lost opportunities in the short run, loss of control for public/producer IP in the long run
4.0 Final words

• The status quo is not a good option- too little research investment
• There is some momentum for change
• Producers, industry and governments have to get informed, push for change and be willing to compromise if change to achieved
Sources for increased research funding

“If you come to a fork in the road, take it.” Yogi Berra

- Public funding
- Royalties & seed sales
- Levies & check-offs
Thank you for your Attention!

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Four options:

A. The MNE model
B. The Pulse/GRDC Model
C. The Ausi GRDC-EPR model
D. The Status Quo
A. The MNE model

- Maximize MNE investment
  - Increase Intellectual Property Rights
  - End point Royalties are the ultimate
  - public institutions get out of breeding
  - public institutions move to supportive research and upstream germplasm development
  - Tax credits and other research subsidies
Outcomes of Option A:

• Entry of MNE research investment leading to an acceleration of yield improvement.
• The loss of public varieties in the medium term
• eventual concentration of the seed industry
• A significant reduction in knowledge sharing and in the freedom to operate for plant breeders
• Much higher wheat seed costs/technology use fees for producers
B. The Pulse/GRDC Model

- Producer levies would be increased to 1% of sales
  - This would require producer support and law change
  - Government matching would make this more attractive

- a non-profit “Producer Inc.” would breed and commercialize new varieties

- MNE would be free to enter the industry and negotiate access to the remaining pool of germplasm
Outcomes of Option B:

• At the new levels the “Producers Inc.” Would have funding well beyond current levels
  – $40-50 million per year for wheat
  – Large by Canadian terms but small by MNE terms
• Producers Inc. would be short of capital to get up and running- contracting
• Private MNE could enter the industry expanding the choice for producers
• The existence of the Producers Inc. varieties in the market place could moderate the prices charged by the private industry but might deter entry
C: The Ausi GRDC/EPR model

- Legislation would be introduced to establish:
  - End Point Royalties
  - 1% levies
  - Producer Inc.
  - *Producer Inc.* would partner with one or more MNE to set up a for profit corporation for wheat breeding and variety commercialization.
  - The Producer Inc/MNE joint venture would return a portion of their dividends to the Producer Inc., which would reinvest their dividends into research
Outcomes of Option C:

- If the Producer Inc. is committed to reinvesting all dividends into research the MNE company would grow into a research intensive company that should eventually become the dominant wheat breeding company.
- Seed prices would increase as the low price pre-existing public varieties slowly are replaced by newer varieties that outperform them.
- This model would generate more research than Option B and could generate more than option A.
D: The Status quo

- No change in AAFC funding levies, EPRs or commercialization vehicles