Funding Agricultural Research

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Outline

• The producer returns to research
• Funding through Public-Producer-Private Partnerships
• The Australian research system
• Options for funding wheat research in Canada
Producer Returns to Research

• Where are the benefits?
  – Private:
    • Higher yields
    • Lower costs
    • Better quality
  – Public
    • Improved environment
    • Improved health
    • Improved food security
Who pays for research?

- Governments (Taxpayers)
- Producers and Consumers through check offs (levies)
- Producers through seed and other inputs
Stylized Representation of Research Benefits and Costs

Gross annual benefits (dollars per year)

- **Research Costs**
- **Research Benefits**
- **R&D Lag**
- **Adoption Process**

Year
The Measuring the Returns to Research

• Present Value recognizes that “time is money”
  – Getting a dollar today is worth more that getting the dollar a year or five years from now. A 5% discount rate is used in most studies

• Benefit Cost Ratio = PV Benefits/PV Costs

• A B/C equal to implies a 5% rate of return

• A B/C ratio of 2:1 is a very good investment
The internal rate of return is the rate of return earned on the dollars invested.

- 5% is good
do
- 10% is great
- 20% is fantastic
Meta Evidence from Literature Prior to 2000

New Evidence


J.M. Alston, M.A. Andersen, J.S. James, and P.G. Pardey

Springer, January 2010
## Marginal Returns to U.S. Public Agricultural R&E

<table>
<thead>
<tr>
<th></th>
<th>Own-State</th>
<th>National</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>State R&amp;E</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>48-State Average</td>
<td>21.0</td>
<td>32.1</td>
</tr>
<tr>
<td>48-State Minimum</td>
<td>2.4</td>
<td>9.9</td>
</tr>
<tr>
<td>48-State Maximum</td>
<td>57.8</td>
<td>69.2</td>
</tr>
<tr>
<td><strong>USDA Research</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>17.5</td>
<td></td>
</tr>
</tbody>
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**Returns to Benefit-Cost Ratio (3% real discount rate)**

Source: Persistence Pays – Alston et al. 2010
Canadian Returns to Research

- WGRF 2012
- Zero till 201
- Regional Variety Trials
- Sask Pulse Growers 2008
# The Returns to WGRF cereal research 1994-2030

<table>
<thead>
<tr>
<th>Varietal Type/Class</th>
<th>Benefit/Cost Ratio</th>
<th>Internal Rate of Return %</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Wheat</td>
<td>20.40</td>
<td>36%</td>
</tr>
<tr>
<td>CWRS</td>
<td>31.13</td>
<td>42%</td>
</tr>
<tr>
<td>CWHW</td>
<td>2.22</td>
<td></td>
</tr>
<tr>
<td>CWAD</td>
<td>35.91</td>
<td>44%</td>
</tr>
<tr>
<td>CPS</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>CWES</td>
<td>0.22</td>
<td></td>
</tr>
<tr>
<td>CWRW</td>
<td>1.26</td>
<td></td>
</tr>
<tr>
<td>CWSWS</td>
<td>28.42</td>
<td></td>
</tr>
<tr>
<td>All Barley</td>
<td>7.56</td>
<td>28%</td>
</tr>
<tr>
<td>2-R Malt</td>
<td>6.51</td>
<td>26%</td>
</tr>
</tbody>
</table>

Source: Gray Nagy Guzel (2012)
The Returns to Zero Tillage Research

• Gray and Nagy (2011) found:
  – Public research expenditures 52 to 1 Benefit / Cost Ratio
  – Machinery Sector $121 in sales for every $1 invested in research
Benefits of Regional Variety Trials 1971-2010
($Million)

63:1 Benefit Cost Ratios
## SPG Pulse Research (1984-2024)

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<th>Genetics Research</th>
<th>Development Acceleration</th>
<th>Total Impact</th>
</tr>
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<tr>
<td><strong>Producer Ben/Cost</strong></td>
<td>27.81</td>
<td>15.77</td>
<td>20.19</td>
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<tr>
<td><strong>Producer IRR</strong></td>
<td>39.5%</td>
<td>40.4%</td>
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<tr>
<td><strong>Industry Ben/Cost</strong></td>
<td>26.91</td>
<td>23.29</td>
<td>24.6</td>
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**Source:** Gray, Galusko, Nagy and Weseen, 2008
The Underfunding of Research is Problem #1

• High B/C ratios indicate many lost opportunities
• research can increase economic growth while addressing food security
• can learn from other Agricultural Knowledge Systems
3 potential funding sources – 3 roles

• **Private firms** – can only provide excludable private goods

• **Producer (Industry) funding** – can also provide industry specific non-excludable goods

• **Public Research** – can also provide (general – non excludable) public goods
# 3 Types of Knowledge Inputs for Innovation

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<td>Agronomy/ best management practices</td>
<td>Protected production process</td>
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<td>knowledge dissemination product, input testing</td>
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A balanced “4P” approach is needed

- **4P**: Private-Producer-Public Partnerships
- **Balance is required for:**
  - greater overall funding
  - to provide industry goods and public goods while tapping into global IP
Avoid the UK wheat model

- IPRs are too weak - 53% of average royalty paid on saved seed, which also limits royalties
- $27 million revenue is split between six very small breeding programs with little or no private upstream research
- 15 year gap in partnership with public research
- “the get out of the way and they will come” approach did not work well – several elements were missing
Australia’s balanced approach

• Matched (1% + .5 %) (non-refundable) check-off funding of Gross industry sales for grains and most other ag products- GRDC became the driver of the whole system

• Continued public support for basic research

• Strong IPRs and creation of three breeding firms with private-producer-public shareholders
Aussie Wheat PPPPs

**Australian Grain Technologies Pty Ltd (2002)** - the GRDC, the South Australian Research and Development Institute, Limagrain and the University of Adelaide.

**The InterGrain Pty Ltd (2007) — DAFWA, GRDC, Monsanto**

**HRZ Wheats Pty Ltd (2003)** - CSIRO, NZPFR, the GRDC and Landmark Operations Ltd. Recently Dow AgroSciences
End Point Royalties

- *End Point Royalties (EPRs)* collected on the sale of harvested grain
- reduced producer risk
- Full royalties even with farm saved seed
- *EPRs* are now generating enough revenue to support 4 breeding firms but it took 15 years to get there
- Future EPRs will quickly exceed research funding requirements
- Long process of ramp up. An application of uniform EPRs to all varieties can generate immediate cash flow for breeders.
Wheat End Point Royalty Rates ($/t) by year of variety release
Comparison of Research Intensity (% of sales) Across Funding Regimes
The 4P balanced approach - Part 1

• Governments should work with industry to pass legislation that will create a one-percent End Point Royalty on the sale of all crops that would be paid to variety owners
  – This would provide a large and immediate stream of revenue for all successful crop breeders without a long phase in period
  – Could make Canada UPOV 91 compliant
The 4P balanced approach - Part 2

- The federal government should use its research mandate to create national producer-controlled, non-refundable check-off funded research corporations.
  - Accountability can be enhanced with a share structure.
  - The corporations similar to the Australian RDC models could undertake applied R&D and extension for the benefit of the sector.
  - As in Australia, these corporations would also be in a position to foster 4P partnerships with the private and public sector.
The 4P balanced approach – Part 3

• Government should continue their public support for basic and applied scientific research
Summary

• High rates of return to research indicate lost opportunities to do more
• Uniform EPRs provide an immediate income stream
• Non-refundable producer check-off corporations can provide needed industry goods
• Public research can focus on public goods
• System works the best through 4P partnerships
• Widespread engagement and planning is required