AAFC and the Future of Cereal Breeding

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Science and Technology Branch
Public programs dominate wheat variety development

<table>
<thead>
<tr>
<th>Breeding institution</th>
<th>2004 to 2008 (% acreage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAFC</td>
<td>78.0</td>
</tr>
<tr>
<td>- Swift Current (SPARC)</td>
<td>52.2</td>
</tr>
<tr>
<td>- Winnipeg (CRC)</td>
<td>23.7</td>
</tr>
<tr>
<td>- Lethbridge (LRC)</td>
<td>2.0</td>
</tr>
<tr>
<td>Univ. of SK</td>
<td>8.5</td>
</tr>
<tr>
<td>Univ. of MB</td>
<td>0.2</td>
</tr>
<tr>
<td>Univ. of AB</td>
<td>0.0</td>
</tr>
<tr>
<td>Alberta Agriculture &amp; Rural Development</td>
<td>0.0</td>
</tr>
<tr>
<td>Syngenta + Viterra</td>
<td>11.5</td>
</tr>
<tr>
<td>Other</td>
<td>2.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>
Wheat breeding is a long-term investment

- **Germplasm resource base**
  - Acquisition, evaluation, characterization, development, utilization, preservation, distribution

- **Population improvement**
  - Cross parental lines and grow hybrid seed
  - 1-1½ years

- **Row evaluation**
  - (productivity and pest resistance)

- **Replicated evaluation**
  - (productivity, pest resistance and end-use quality)

- **Registration**
  - Reg. trial 1
  - Reg. trial 2
  - Reg. trial 3

- **Pedigreed seed production**

- **Distribution and sale**

- **Winter nursery**
  - 3-6 years

- **7-9 years**

- **7-20 years**

- **1-1½ years**

- **Doubled haploid production and seed increase**
Farmer support and Growing Forward Programs

• WGRF
  – Long-term partnership with AAFC since 1995
  – WGRF averages $3M/yr ($2M in salaries/$1M NPO)
  – Close to $40M farmer investment by check off
  – More than $220M public investment

• GFO
  – Support wheat variety development for eastern Canada

• GF programs
  – Wheat Cluster $8.2M (Major source of NPO)
  – DIAP - Secan and CFCRA
## AAFC’s investment*: Field crop improvement

<table>
<thead>
<tr>
<th>Crop</th>
<th>No. of Professional FTE&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Total Salary Budget ($M)&lt;sup&gt;2&lt;/sup&gt;</th>
<th>Total NPO Budget ($M)&lt;sup&gt;3&lt;/sup&gt;</th>
<th>Total Budget ($M)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheat&lt;sup&gt;4&lt;/sup&gt;</td>
<td>35.0</td>
<td>14.9</td>
<td>5.6</td>
<td>20.5</td>
</tr>
<tr>
<td>Brassicas</td>
<td>24.8</td>
<td>7.6</td>
<td>5.3</td>
<td>12.9</td>
</tr>
<tr>
<td>Pulses</td>
<td>11.8</td>
<td>3.4</td>
<td>2.2</td>
<td>5.6</td>
</tr>
<tr>
<td>Soybeans</td>
<td>12.1</td>
<td>3.1</td>
<td>1.4</td>
<td>4.5</td>
</tr>
</tbody>
</table>

*Based on 2011-12 figures Pre-Budget 2012

**Includes:**

1. Pathology, entomology and quality professionals
2. 20% benefits
3. 15% administrative overhead
4. WGRF long-term commitment to AAFC wheat research
Mean relative yield of recommended CWRS varieties by year

Mean adjusted relative yield (%)

- Manitoba Seed Guide
  - Mean yield improved by 0.62% per year

- Saskatchewan Seed Guide
  - Mean yield improved by 0.42% per year
Canadian Seed Trade Association (CSTA) – *members invest in innovation*

![Graph showing cereal investment over time from 1987 to 2012.]
The innovation funding gap for wheat

• $60-70M of new private sector investment is needed
  – Private sector should be main investor

• Private sector will not invest:
  – If public sector is a competitor
  – If the rules do not allow a return on investment
  – If the crop acreage is too small (e.g. winter wheat)
Budget 2012 Strategy: wheat funding gap

- **Strong signal to private sector that:**
  - AAFC wishes to vacate variety “finishing” space
  - AAFC invests in areas that benefit farmers but are not profitable for private sector (e.g. NRC Wheat Flagship)

- **There is time for private sector to ramp up**
  - Syngenta and Bayer Crop Science already have small prairie wheat variety development programs
  - Dow Agri-Sciences acquired Hyland seeds in 2009 and invests in winter wheat in eastern Canada
  - Private sector could also include producers
Impacts of Budget 2012 (post-March 2014)

- East: Reduction of 2 to 1 breeder (Spring and Winter) and 1 wheat pathologist
- West: Reduction of 2 breeders and 37 support positions
- Reduction in capacity in wheat variety finishing
  - Fewer field and quality lab staff
  - Capacity reduced by about 40%
- AAFC’s program changes in finishing varieties will be gradual
  - Wheat breeding retained at Swift Current and Lethbridge
Short-term impacts: Budget 2012

• Agreements
  – Commitment to finish existing Cluster and DIAP work (March 31, 2013) (WGRF and GFO)
  – WGRF 5-year agreement will need to be re-negotiated as milestones will not be met

• Varieties
  – No obvious impact for next 3 years as lines will be in the coop test system
  – Beyond 2015, number of AAFC varieties will decrease
Longer term impacts: 2017+

• AAFC’s role has changed
  – AAFC develops useful traits
    • disease resistance, wheat starch with low glycolytic potential
  – Private sector co-invests in pre-competitive research areas
  – AAFC has capacity to develop next generation technology (heat and cold tolerance)

• Private sector
  – 2 or more companies have large Canadian wheat breeding investments and develop globally competitive varieties
Focus for next 12 months ...

- AAFC to have an approved wheat strategy
  - Germplasm transfer policy
  - Review of variety registration
  - Crop funding mechanism
  - Protection of IP (UPOV91)
  - Need for a national wheat organization

- Work with stakeholders through NVRT Grains

- Create environment for private sector investment
Public – Producer/Private

Public/Producer
AAFC and Universities

Germplasm + Consortia
Investment

Public good trait
development

Variety release – minor classes?

Producer/Private

Participant/Private

Trait development
Variety development

Testing and evaluation

Accelerated variety release