Strengthening Producer-Funded Support for Research through Government Matching: Australian Experience and Lessons for the United States

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Main Points

- **Levy-based funding** could be an efficient and equitable way to strengthen funding for some types of applied agricultural R&D at a time when public funding support is waning.

- **Generally** not a significant source of funding for R&D (vs marketing) and is underutilized.

- In Australia has been a major source of funding for agricultural R&D (as well as marketing) for 30+ years.

- **Key provisions contributing to success in Australia**
  - producer control over spending priorities
  - matching government support (1:1 up to 0.5% of levy revenue)

- **Sustainability questions**
  - is matching government support justified, and will it continue?
  - will producers support maintaining or increasing levies?
Main Points

- High benefit-cost ratios imply persistent underinvestment in spite of government support – why?
  - levy rates set too low to maximize national benefits—why?

- Must account for real-world complications to make these programs sustainable (effective, efficient, equitable)
  - diseconomies of diversity (versus economies of scale and scope)
  - costly processes of levy change
  - supermajority requirements
  - costly information and uncertainty
  - agency problems

- Evolving issues ↔ sustainability questions
  - changing governance rules
  - matching support under threat (always!)
  - marketing versus R&D in organizations engaged in both
  - alternatives/complements (EPRs) add complications
Australia’s Rural R&D System

Rural research, development and extension investment in Australia

Niki Millist, Will Chancellor and Tom Jackson

Research by the Australian Bureau of Agricultural and Resource Economics and Sciences

Research Report 17.11
September 2017


Figure S2 Simplified flow of investment through the rural R&D system, 2014–15

Total rural R&D funding $3 billion

- Private ($1,462m)
- Australian Government ($952m)
- State and territory government ($239m)
- Universities ($345m)

- RDCs ($483m)
- CRCs ($100m)

Total rural R&D performed $3.1 billion

Australia’s Rural R&D Corporations

- **R&D Corporation (RDC) model**
  - foundations in 1950s
  - precursor “Councils” introduced in 1985
  - “Corporate” structure introduced in 1989 legislation, with further revisions in 1991
  - some evolution since

- **Key Features**
  - industries could establish levy-based R&D funds
  - committed Commonwealth to provide a dollar-for-dollar matching up to 0.5% of output value
    - some levies exceed 0.5%
    - some matching for voluntary contributions
  - substantial autonomy
  - substantial producer representation
  - created several non-commodity RDCs
    - only one survives!
<table>
<thead>
<tr>
<th>Rural R&amp;D Corporation</th>
<th>Industry Contribution</th>
<th>Government Contribution</th>
<th>Total Expenditure</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Statutory RDCs</strong></td>
<td></td>
<td></td>
<td>A$ million in 2014-15</td>
</tr>
<tr>
<td>Grains RDC</td>
<td>117.6</td>
<td>67.9</td>
<td>185.4</td>
</tr>
<tr>
<td>Fisheries RDC</td>
<td>7.4</td>
<td>18.7</td>
<td>26.1</td>
</tr>
<tr>
<td>Australian Grape and Wine Authority</td>
<td>11.9</td>
<td>12.4</td>
<td>24.2</td>
</tr>
<tr>
<td>AgriFutures Australia (was RIRDC)</td>
<td>4.5</td>
<td>12.7</td>
<td>17.2</td>
</tr>
<tr>
<td>Cotton RDC</td>
<td>7.3</td>
<td>7.3</td>
<td>14.6</td>
</tr>
<tr>
<td><strong>Industry Owned Corporations</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meat and Livestock Australia Ltd</td>
<td>55.3</td>
<td>42.3</td>
<td>97.6</td>
</tr>
<tr>
<td>Horticulture Australia Ltd</td>
<td>43.1</td>
<td>41.0</td>
<td>84.1</td>
</tr>
<tr>
<td>Dairy Australia Ltd</td>
<td>25.8</td>
<td>21.4</td>
<td>47.2</td>
</tr>
<tr>
<td>Australian Wool Innovation Ltd</td>
<td>19.4</td>
<td>12.5</td>
<td>31.8</td>
</tr>
<tr>
<td>Sugar Research Australia Ltd</td>
<td>22.7</td>
<td>6.1</td>
<td>28.7</td>
</tr>
<tr>
<td>Australian Meat Processor Corp. Ltd</td>
<td>14.2</td>
<td>0.0</td>
<td>14.2</td>
</tr>
<tr>
<td>Australian Pork Ltd</td>
<td>5.2</td>
<td>5.2</td>
<td>10.4</td>
</tr>
<tr>
<td>Forest and Wood Products Australia Ltd</td>
<td>2.6</td>
<td>3.3</td>
<td>5.9</td>
</tr>
<tr>
<td>Australian Egg Corporation Ltd</td>
<td>2.0</td>
<td>1.8</td>
<td>3.8</td>
</tr>
<tr>
<td>Australian Livestock Export Corp. Ltd</td>
<td>0.9</td>
<td>0.0</td>
<td>0.9</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>339.8</strong></td>
<td><strong>252.7</strong></td>
<td><strong>592.6</strong></td>
</tr>
</tbody>
</table>

RDC Spending in Perspective

- According to Millist et al. (2017) total public funding for agricultural R&D (excluding food R&D) in Australia was about A$1.5 billion in 2014-15

- RDCs spent about 40% of that total (A$600 million), financed
  - a bit over half from levies
  - a bit less than half from the Commonwealth government

- In spending their share RDCs significantly influence the rest of the public (and private) spending

- Issues arise about
  - the effects on the research agenda
  - whether the rate of matching grant is appropriate
    - fairness?
    - efficiency (crowding in or crowding out? additionality?)
# RDC Funding and Expenditure

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Millions of Australian Dollars (nominal)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Industry Contribution</td>
<td>26.5</td>
<td>48.5</td>
<td>102.6</td>
<td>247.6</td>
<td>339.8</td>
</tr>
<tr>
<td>Commonwealth Contribution</td>
<td>23.7</td>
<td>68.5</td>
<td>126.2</td>
<td>218.1</td>
<td>252.7</td>
</tr>
<tr>
<td><strong>Total Expenditure</strong></td>
<td>47.5</td>
<td>121.2</td>
<td>239.2</td>
<td>488.2</td>
<td>592.6</td>
</tr>
</tbody>
</table>

**Millions of Australian Dollars (real, 2010 values)**

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Expenditure</strong></td>
<td>116.7</td>
<td>222.4</td>
<td>383.9</td>
<td>519.9</td>
<td>560.6</td>
</tr>
</tbody>
</table>

*Source: Based on Productivity Commission (2011) and Millist et al. (2017)*
Performance Reviews

- **ACIL Tasman (2011)**
  - BCAs for 160 RDC projects undertaken over 2008–2010
  - average BCRs (median BCRs)
    - after 5 years: 5.1 (2.7)
    - after 20 years: 9.2 (4.5)
    - after 30 years: 10.7 (5.0)

  - reported similar evidence and accepted that BCRs were favorable
  - nevertheless recommended reduced rates of matching support
    - especially for ”industry-focused” RDCs
## U.S. Potential for Levy-funded R&D

<table>
<thead>
<tr>
<th></th>
<th>2017 Farm Cash Receipts</th>
<th>Industry Contribution @ 0.5%</th>
<th>Government Contribution @ 1:1</th>
<th>Total Funds</th>
</tr>
</thead>
<tbody>
<tr>
<td>All commodities</td>
<td>$366.6</td>
<td>$1,832.8</td>
<td>$1,832.8</td>
<td>$3,665.5</td>
</tr>
<tr>
<td>Animals and products</td>
<td>$176.5</td>
<td>$882.5</td>
<td>$882.5</td>
<td>$1,764.9</td>
</tr>
<tr>
<td>Meat animals</td>
<td>$89.2</td>
<td>$445.9</td>
<td>$445.9</td>
<td>$891.9</td>
</tr>
<tr>
<td>Cattle and calves</td>
<td>$67.6</td>
<td>$337.9</td>
<td>$337.9</td>
<td>$675.8</td>
</tr>
<tr>
<td>Hogs</td>
<td>$21.6</td>
<td>$108.0</td>
<td>$108.0</td>
<td>$216.0</td>
</tr>
<tr>
<td>Dairy products, Milk</td>
<td>$38.4</td>
<td>$191.8</td>
<td>$191.8</td>
<td>$383.7</td>
</tr>
<tr>
<td>Poultry and eggs</td>
<td>$41.9</td>
<td>$209.6</td>
<td>$209.6</td>
<td>$419.2</td>
</tr>
<tr>
<td>Broilers</td>
<td>$29.8</td>
<td>$149.1</td>
<td>$149.1</td>
<td>$298.3</td>
</tr>
<tr>
<td>Crops</td>
<td>$190.1</td>
<td>$950.3</td>
<td>$950.3</td>
<td>$1,900.6</td>
</tr>
<tr>
<td>Food grains</td>
<td>$11.0</td>
<td>$55.0</td>
<td>$55.0</td>
<td>$109.9</td>
</tr>
<tr>
<td>Rice</td>
<td>$2.4</td>
<td>$11.8</td>
<td>$11.8</td>
<td>$23.7</td>
</tr>
<tr>
<td>Wheat</td>
<td>$8.6</td>
<td>$42.8</td>
<td>$42.8</td>
<td>$85.6</td>
</tr>
<tr>
<td>Feed crops</td>
<td>$54.6</td>
<td>$273.0</td>
<td>$273.0</td>
<td>$546.1</td>
</tr>
<tr>
<td>Corn</td>
<td>$45.8</td>
<td>$228.8</td>
<td>$228.8</td>
<td>$457.5</td>
</tr>
<tr>
<td>Cotton</td>
<td>$7.4</td>
<td>$37.2</td>
<td>$37.2</td>
<td>$74.4</td>
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<tr>
<td>Oil crops</td>
<td>$42.6</td>
<td>$212.8</td>
<td>$212.8</td>
<td>$425.5</td>
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<tr>
<td>Vegetables and melons</td>
<td>$20.4</td>
<td>$102.2</td>
<td>$102.2</td>
<td>$204.4</td>
</tr>
<tr>
<td>Fruits and nuts</td>
<td>$23.8</td>
<td>$118.8</td>
<td>$118.8</td>
<td>$237.7</td>
</tr>
</tbody>
</table>
California Mandated Marketing Programs

<table>
<thead>
<tr>
<th>Type of CA Program</th>
<th>Promotion</th>
<th>Research</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$ millions in 2004-05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Federal Marketing Orders (11)</td>
<td>24.8</td>
<td>3.6</td>
<td>41.6</td>
</tr>
<tr>
<td>California Marketing Orders (29)</td>
<td>71.4</td>
<td>13.1</td>
<td>101.1</td>
</tr>
<tr>
<td>CA Commodity Commissions (20)</td>
<td>50.7</td>
<td>8.2</td>
<td>75.4</td>
</tr>
<tr>
<td>CA Commodity Councils (3)</td>
<td>7.1</td>
<td>0.2</td>
<td>8.6</td>
</tr>
<tr>
<td>Total (63)</td>
<td>154.0</td>
<td>25.0</td>
<td>226.7</td>
</tr>
</tbody>
</table>

- In 2004 applied to 2/3 of total CA farm production value
  - total farm value of commodities under check-offs: $21 billion
  - total program spending ≈ 1% of this production value
  - research spending ≈ 0.1% of gross value for these commodities

Source: Carman (2007)
Lessons?
Lessons

- Levy-based funds can provide an efficient and fair source of funding for commodity collective (toll) goods, including certain types of R&D

- In practice, around the world (including the United States) levies are used much more extensively for commodity promotion than R&D

- Australia’s rural RDC system appears to have
  - significantly enhanced Australia’s total agricultural R&D portfolio over the past 30+ years
  - influenced the emphasis within that portfolio

- Issue of mutual additionality is crucial consideration for both government and producer partners
Lessons (continued)

- Real-world levy-based programs involve many features that are often ignored in discussions of how they work:
  - large transaction costs and institutional inertia
  - information problems
  - supermajority requirements with diverse constituents
  - agency problems

- Theoretical analysis that allows for these characteristics shows that
  - levies will tend to be set too low to maximize net social benefits
  - matching government grants can be helpful by
    - encouraging an increase in levy rates
    - adding directly to the available research resources
Some related institutional innovations
Cooperative Research Centers (CRCs)

- Public-private partnerships, not just for agriculture

Agricultural CRCs typically involved
  - private firms
  - RDCs
  - CSIRO & universities
  - NGOs
  - Commonwealth and State government departments

Focused program of applied research
  - specific issue (e.g., wheat quality; dryland salinity; weed management)
  - finite horizon (typically 5–7 years; some much longer)
  - typically < $10 million /year (some much greater)
    - core funding from Commonwealth government
    - $2.5 m – $3.5 m per year
End-Point Royalties (EPRs)

- Enabled by 1994 Plant Breeders Rights (PBR) Act
  - IP owners collect variety-specific royalties (rates set by owners upon first release) when grain is delivered to the first handler
    - requires cooperation of marketers
  - affords IP protection for self-pollinating crops comparable to that of seed for hybrids or patented varieties
    - some issues with evasion in vertically-integrated businesses
  - have become significant for wheat in Australia
    - public-private partnerships
    - now commercially self-reliant
End-Point Royalties (EPRs)

- Four for-profit breeding firms were established after GRDC announced a tender in 1999
  - Australian Grain Technologies Pty Ltd
    - GRDC & SARDI & U. Adelaide => ?? (many changes)
  - InterGrain Pty Ltd
    - GRDC & DAFWA => GRDC & DAFWA & Monsanto => ??
  - LongReach Plant Breeders
    - GRDC & AWB & Syngenta => Pacific Seeds & Syngenta => ??
  - HRZ Wheats
    - GRDC & CSIRO & NZ Plant and Food Research & Landmark Operations Ltd => & Dow => ??

- State Departments of Agriculture & GRDC no longer maintain significant wheat breeding programs
End-Point Royalties (EPRs)

Weighted average wheat EPR rate in Western Australia, 1999–2011

Source: Gray, Kingwell, Galushko and Bolek (2017)
Crop Research Intensity by Funding Source, and Private Rents – 2010

Source: Alston and Gray (2013)
Thank You!

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