Research Funding and Farm Productivity
Implications for U.S. Farm Policy

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Outline

- U.S. Agricultural R&D in a Global Context
  - Agriculture vs Total R&D Spending
  - U.S. vs World Agricultural R&D
- Trends in U.S. Public Agricultural R&D
  - Overall Funding Trends
  - Sources of Funds
  - Orientation of Funds
  - Congruence of R&D and Value of Production
- U.S. Productivity
  - Trends and Spatial Patterns
  - Slowdown
  - Causes, Consequences, and Implications
- Farm Bill and Beyond
  - Australian RDC Model
  - Farm Bill Proposals

Public Agricultural R&D Expenditures

<table>
<thead>
<tr>
<th></th>
<th>1981</th>
<th>2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latin America &amp; Caribbean</td>
<td>12%</td>
<td>31%</td>
</tr>
<tr>
<td>Sub-Saharan Africa (excluding China)</td>
<td>14%</td>
<td>15%</td>
</tr>
<tr>
<td>China</td>
<td>14%</td>
<td>16%</td>
</tr>
<tr>
<td>Other Developing</td>
<td>11%</td>
<td>18%</td>
</tr>
<tr>
<td>Developed Countries</td>
<td>32%</td>
<td>41%</td>
</tr>
</tbody>
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$16.0 billion

$24.9 billion
Public Agricultural R&D Expenditures

Estimated Total Ag R&D Investments, 2000

Agricultural Research Intensities, 2000
U.S. Public Sector Agricultural R&D, 1890-2004

- Intramural USDA Research
- State Agricultural Experiment Stations
  - 30 percent federal sources
  - 47 percent state government
  - 22 percent other sources
    - Industry
    - Royalty revenue
    - Other self-generated income
- Extension
  - 21 percent federal sources
  - 79 percent within-state sources

USDA Roles in Public Agricultural R&D

U.S. Public Agricultural R&D, 2004
Share of Public R&D Directed to Enhancing Farm Productivity

Productivity Patterns and Policy Implications

- U.S. Productivity
  - Trends and Spatial Patterns
  - Slowdown
  - Causes, Consequences, and Implications

- Farm Bill and Beyond
  - Australian ROC Model
  - Farm Bill Proposals

U.S. Agricultural Productivity, 1949-2002

- Multi-Factor Productivity
- Output Index
- Input Index
Each diamond represents one state. Values are averages of year-to-year state-specific rates of growth in outputs and inputs.

45-degree line through the origin indicates combination with no growth in productivity.

45-degree line through U.S. indicates growth in productivity equal to U.S. average.
Spatial Patterns of Input and Output Growth
Southern States

Temporal Patterns of Input and Output Growth, Pre- and Post-1990

Annual Productivity Growth Averages Across States

<table>
<thead>
<tr>
<th>Period</th>
<th>U.S.</th>
<th>State Data Average</th>
<th># of Obs.</th>
<th>p-val*</th>
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<tbody>
<tr>
<td>1990-89</td>
<td>2.01</td>
<td>2.01</td>
<td>1920</td>
<td>0.09</td>
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<tr>
<td>1990-79</td>
<td>2.05</td>
<td>2.23</td>
<td>480</td>
<td>0.15</td>
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<tr>
<td>1990-69</td>
<td>1.67</td>
<td>1.90</td>
<td>480</td>
<td>0.43</td>
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<tr>
<td>1970-79</td>
<td>2.51</td>
<td>2.03</td>
<td>480</td>
<td>0.28</td>
</tr>
<tr>
<td>1960-69</td>
<td>1.61</td>
<td>1.89</td>
<td>480</td>
<td>0.70</td>
</tr>
<tr>
<td>1990-02</td>
<td>1.11</td>
<td>0.70</td>
<td>624</td>
<td>0.00</td>
</tr>
<tr>
<td>1950-02</td>
<td>1.79</td>
<td>1.69</td>
<td>2,544</td>
<td>na</td>
</tr>
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</table>

*p-val. from a t-test comparing mean to full sample mean of 1.69%
**Causes of Slower U.S. Productivity Growth**

- Reduced support for farm productivity R&D?
  - Slower growth in total agricultural R&D investments
  - Shrinking share for farm productivity

- Other possibilities?
  - Shifting structure of U.S. general public R&D?
  - Changing private sector roles?
  - Changing regulatory environment?
  - Reduced spillins from other countries and CGIAR?
  - Degradation of natural resource base?
  - Diminishing returns to new technology?
  - Bad weather?

**Consequences of Slower U.S. Productivity Growth**

- Reduced competitiveness compared with
  - China? Latin America? Australia?

- Increased pressure on natural resource base

- Lower farm returns

- Higher food prices

- Reduced technology spillovers to poor LDCs

**Implications of Slower U.S. Productivity Growth**

- May depend on causes

- Regardless of cause, cure requires
  - Public investment in productivity-oriented research
  - Institutional improvements to encourage private investment

- Mechanisms to
  - Direct research funds where payoff is high
  - Minimize transaction costs
The Australian Model

- R&D Corporations (RDCs)
  - Similar to U.S. marketing orders
  - Mandatory upon majority decision
  - Financed by commodity taxes (like check-offs)
- Industry taxes matched by federal government
  - Dollar-per-dollar, up to ½% of value of production
- Funds allocated by RDC board
  - Producer, government, scientist, and other reps
  - Variety of mechanisms
    - Competitive grants
    - Short- and long-term contracts

Advantages of the Australian Model

- Enhanced total funding for agricultural R&D
  - Comparatively high ARIs
- Benefits distributed in proportion to costs
  - Fair and efficient
  - Incentive compatible
- Mutual commitment, politically sustainable
- Public funds freed up for "public goods" R&D
- Synergy with move away from price supports
  - Farmers focus on efficiency and quality

Farm Bill Prospects

- Administration’s Farm Bill proposal
  - Some changes in funding approaches
  - Increased R&D funding for
    - Biofuels; Specialty crops
- Will R&D funds be allocated
  - Effectively? Efficiently?
- Will R&D priorities
  - Emphasize newer agendas?
  - At the expense of farm productivity research?
- Could an RDC model
  - Enhance new initiatives?
  - And renew investments in farm productivity research?
R&D Data and Information Sources

- www.cgiar.org
  - Search for ASTI (Agricultural Science & Technology Indicators)
- www.InSTePP.umn.edu
- www.HarvestChoice.org