# Research Funding and Farm Productivity

## Implications for U.S. Farm Policy


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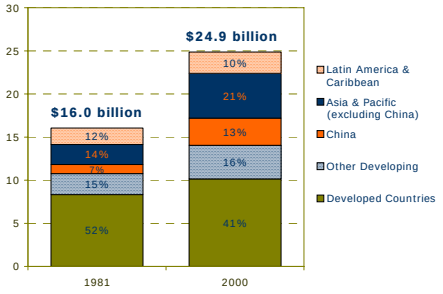
## Outline

- 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



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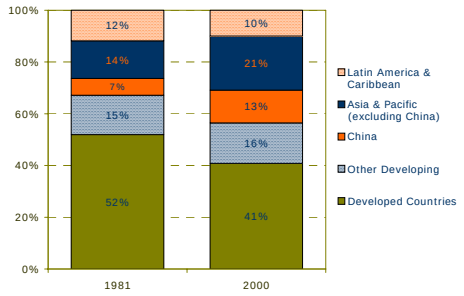
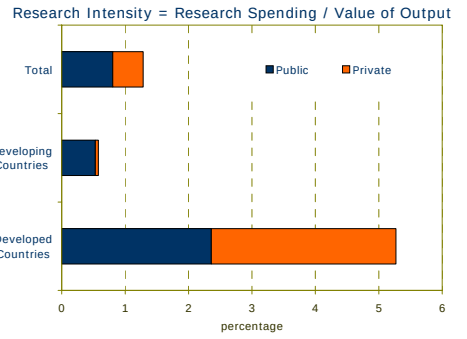


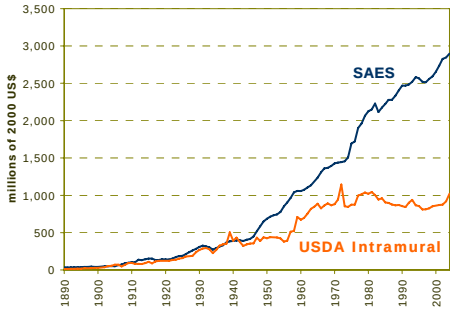

## Estimated Total Ag R&D Investments, 2000

| | Expenditures | | | Public Share of Total |
|---|---|---|---|---|
| | Public | Private | Total | |
| | *(millions international $)* | | | *percent* |
| Latin America and Caribbean (31) | 2,479 | 132 | 2,611 | 94.9 |
| Asia & Pacific (26) | 5,192 | 914 | 6,106 | 85.0 |
| **China** | **3,150** | **338** | **3,489** | **90.3** |
| **Subtotal, Developing Countries (118)** | **14,715** | **1,180** | **15,895** | **92.6** |
| **United States** | **3,828** | **4,601** | **8,428** | **45.4** |
| **Subtotal, Developed Countries (28)** | **10,149** | **12,577** | **22,726** | **44.7** |
| **Total (167)** | **24,864** | **13,756** | **38,620** | **64.4** |

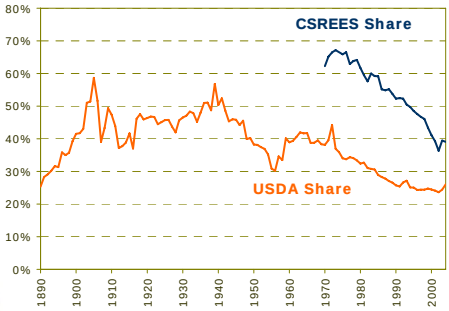
## Agricultural Research Intensities, 2000
### Public and Private Components



## U.S. Public Sector Agricultural R&D, 1890-2004



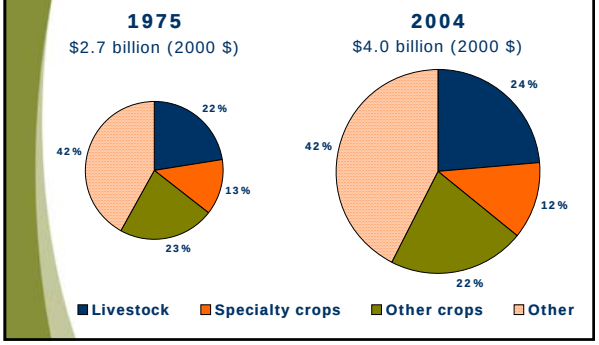

## USDA Roles in Public Agricultural R&D



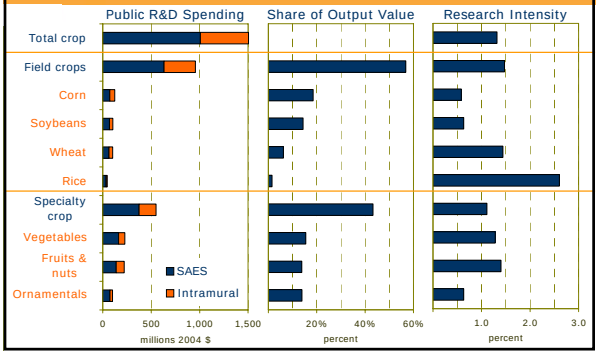

## U.S. Public Agricultural R&D, 2004

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

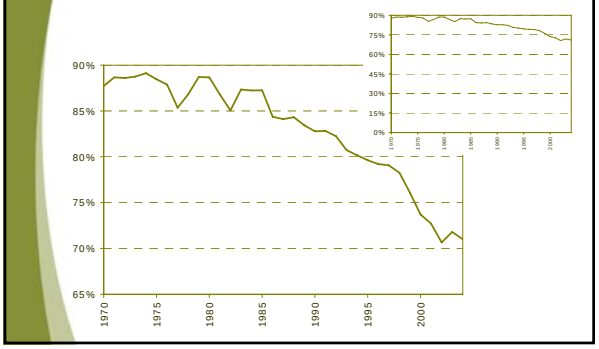
## Commodity Orientation
of U.S. Public Agricultural R&D, 1975-2004



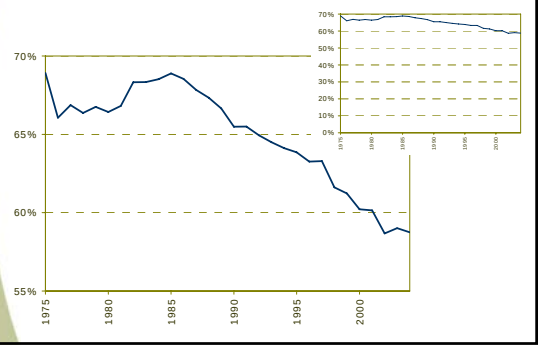

## Congruence Between Research Spending and Crop Value




## USDA Share of Federal Agricultural R&D Funding



## 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
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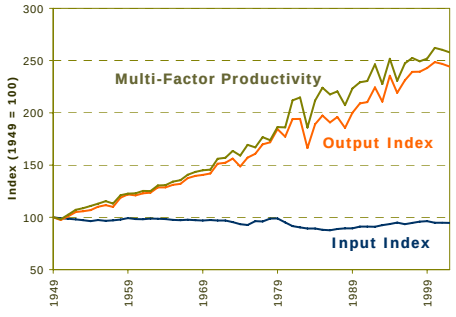
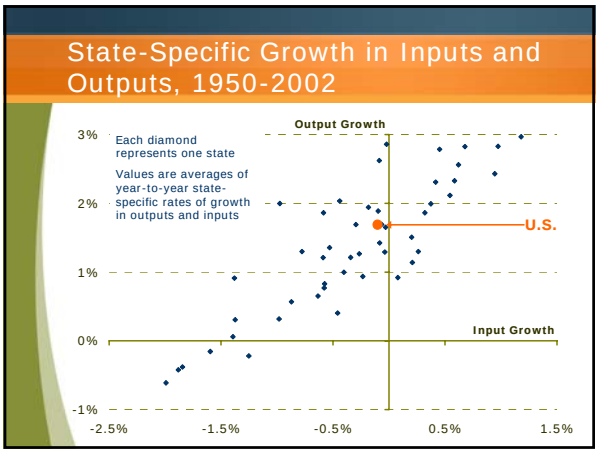
## U.S. Agricultural Productivity, 1949-2002



## State-Specific Growth in Inputs and Outputs, 1950-2002

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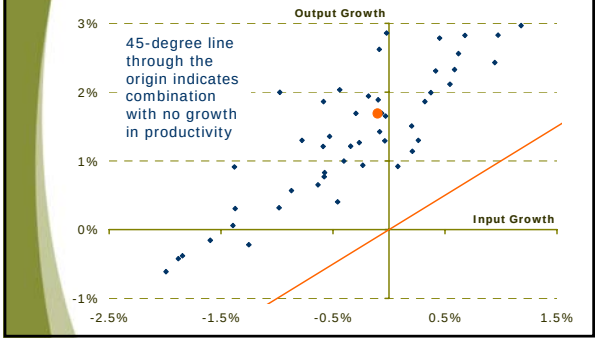


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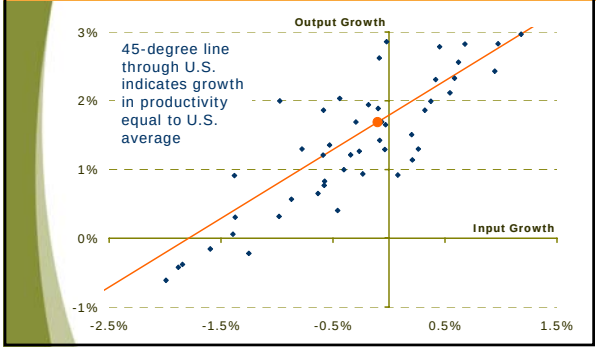
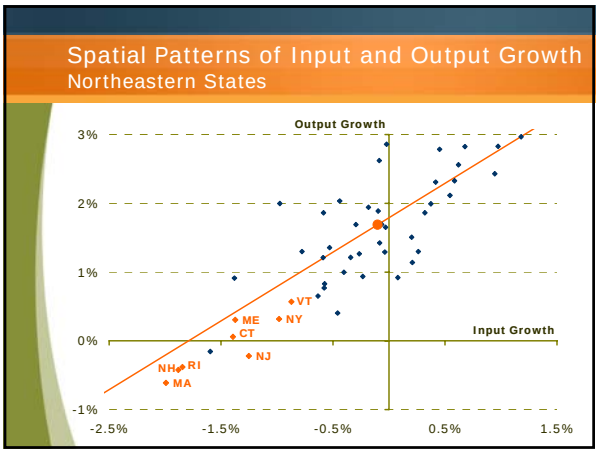
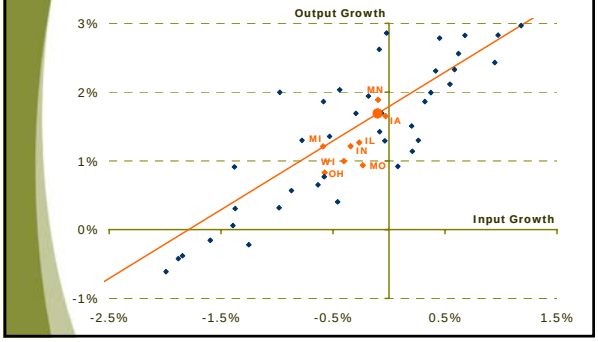


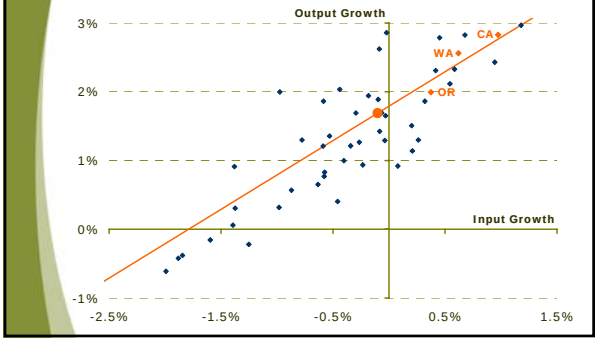
## Spatial Patterns of Input and Output Growth
Northeastern States



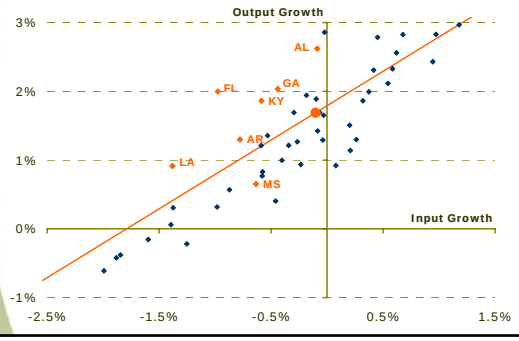

## Spatial Patterns of Input and Output Growth
Corn Belt & Lake States



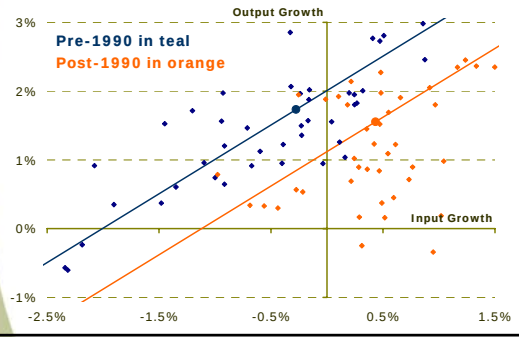

## Spatial Patterns of Input and Output Growth
Pacific States



## 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

| Period | U.S. | State Data | | |
|---|---|---|---|---|
| | | Average | # of Obs. | p-val* |
| | *percent* | | | |
| **1950-89** | **2.01** | **2.01** | **1920** | **0.09** |
| 1950-59 | 2.05 | 2.23 | 480 | 0.15 |
| 1960-69 | 1.67 | 1.90 | 480 | 0.43 |
| 1970-79 | 2.51 | 2.03 | 480 | 0.28 |
| 1980-89 | 1.81 | 1.89 | 480 | 0.70 |
| **1990-02** | **1.11** | **0.70** | **624** | **0.00** |
| **1950-02** | **1.79** | **1.69** | **2,544** | **na** |

**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