
University-based Public Plant Breeding: Past, present and future role of public institutions in crop improvement

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Questions

- How did public institutions become involved in plant breeding?
 - Why are public programs in decline?
 - What will the future look like?
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Historical Perspective:

- 19th century crop genetic improvement initially achieved through germplasm introduction
 - Most introductions from private individuals
 - Mid 19th century – USDA collecting expeditions
 - Government-sponsored seed distribution instituted
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Weak 19th century private seed sector

- Difficult to compete with the public seed distribution programs
 - No quality control
 - Rampant seed scams
 - Farmers mostly saved their own seed
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Publicly supported agricultural research received strong legislative support.

- Morrill Acts of 1862 and 1890 established the land grant universities
 - Hatch Act of 1888 established and funded the state agricultural experiment stations
 - Smith Lever Act of 1913 established and funded the cooperative extension service
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Scientific basis for plant breeding was established at beginning of 20th century

- Mendel's laws rediscovered
 - Many public plant breeding programs initiated
 - Public institutions main source of new varieties
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Seed companies sought less public competition

- Governmental seed distribution program was halted
 - Lobbied for legislation to strengthen private enterprise in agricultural research
 - Intellectual property protection
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Intellectual Property protection for plants and seeds

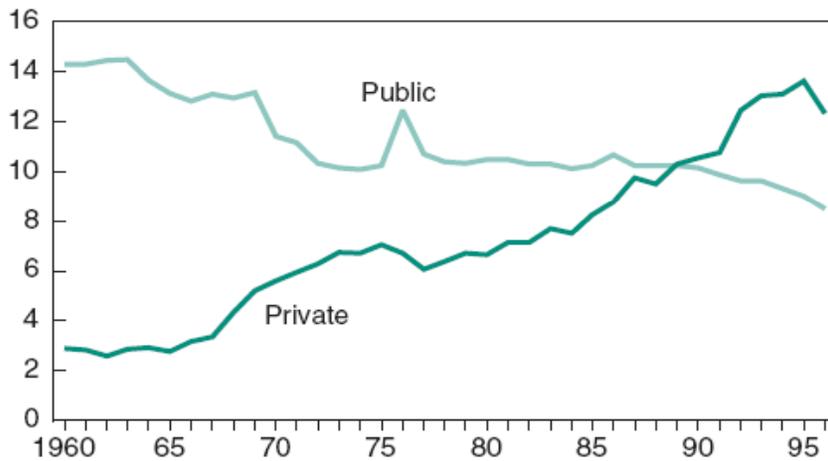
- Plant Patent Act of 1930 (clonally propagated crops)
 - Plant Variety Protection Act of 1970 (seed propagated crops)
 - Utility patents for living organisms in 1980, extended to plants in 2000
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20th Century – strengthening private sector/weakening public sector

- IP protection
 - F₁ Hybrids
 - “Farming has changed from a productive process that originated most of its own inputs and converted them into outputs, to a process that passes materials and energy through from an external supplier to an external buyer.” (Lewontin (quoted in Kloppenburg, 2004, p. 32))
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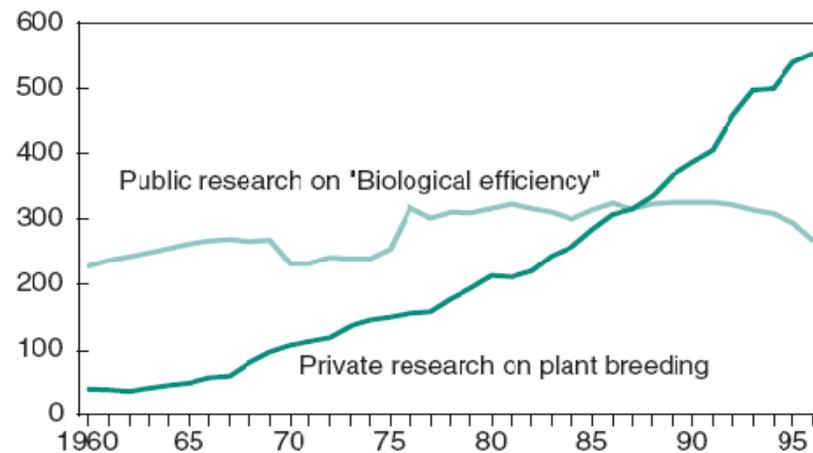
Plant breeding as a share of total agricultural R&D expenditures

Percent



Public and private research expenditures on plant breeding

Million 1996 dollars



<http://www.ers.usda.gov/publications/aib786/>

"Biological efficiency" includes breeding and selection of improved plant varieties.

Trend in the U.S. is towards reduced public support of applied breeding positions

- *Overall reduction in academic positions at land grant universities*
 - *Conversion of plant breeding positions to molecular genetics/ genomics*
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Public plant breeders are an vanishing group

- *Ken Frey's survey: 1990 – 1994*
 - Public sector lost 2.5 SY/Yr
 - Private sector gained 6.4 SY/Yr
 - *Wehner and Guner survey in 2000*
 - Trend continues
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Why reduced public plant breeding?

- Less public sector funding (direct Federal funding & grant programs for plant breeding)
 - Traditional plant breeding is not considered cutting edge research
 - Consolidation of private agricultural companies (fewer stakeholders)
 - Fewer plant breeders trained
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Private enterprise has won the war – now it is worried...

- Who trains the next generation of plant breeders??
 - Major graduate assistantship endowments by Dupont and Monsanto to several land-grant institutions with strong breeding programs in 2007
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Universities' traditional role remains

- Train the next generation
- Innovative scholarship
- Extended education

But...

- Federal & state funding shrinking
 - Departments shrinking
 - Positions not replaced
 - In 50 years
 - Consolidated regional land grant universities
 - Privatized agricultural research
 - Positions preserved thru endowments & sponsorships
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Positive trends

- Renewed interest in food & health (fresh, flavorful, local, green, & healthy)
 - Growing organic sector
 - Plant breeding and education NRI competitive grant program
 - USDA specialty crops initiative in the works
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Final thoughts

- The organic movement & traditional land grant institutions share many common values
 - Public sector can contribute to better organic production
 - Varieties are my bias, but there are many areas for university input
 - Need stakeholders support of public institutions
 - It is a partnership that can close the loops in farming and take us into a sustainable future
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