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DEPARTMENT OF ECONOMIC AND SOCIAL AFFAIRS
STATISTICS DIVISION

Seminar

Addressing Information Gaps in Business and Macro-Economic Accounts to Better Explain Economic Performance

New York, 23 – 24 June 2008
United Nations, Conference room C

Public sector intellectual property
Rick Brenner

Public Sector Intellectual Property --- A Quandary?

A Perspective from the U.S. Department of Agriculture

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Office of Technology Transfer

(Ms. D. June Blalock, Patent Licensing Coordinator)

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United Nations, NYC

Addressing Information Gaps in Business and Macro-Economic Accounts

Definition of Terms

- *Intellectual assets*: documented information, innovations, and know-how
- *Intellectual property (IP):* subset of intellectual assets that can be legally protected
- *Technology transfer (T2):* conversion of intellectual assets into goods and services useful to end users (farmers, processors, consumers)

Intellectual Property License (or "freedom-to-operate") ≠ Technology Transfer

Assets Required for Effective Technology Transfer

- *Intellectual "capital"*

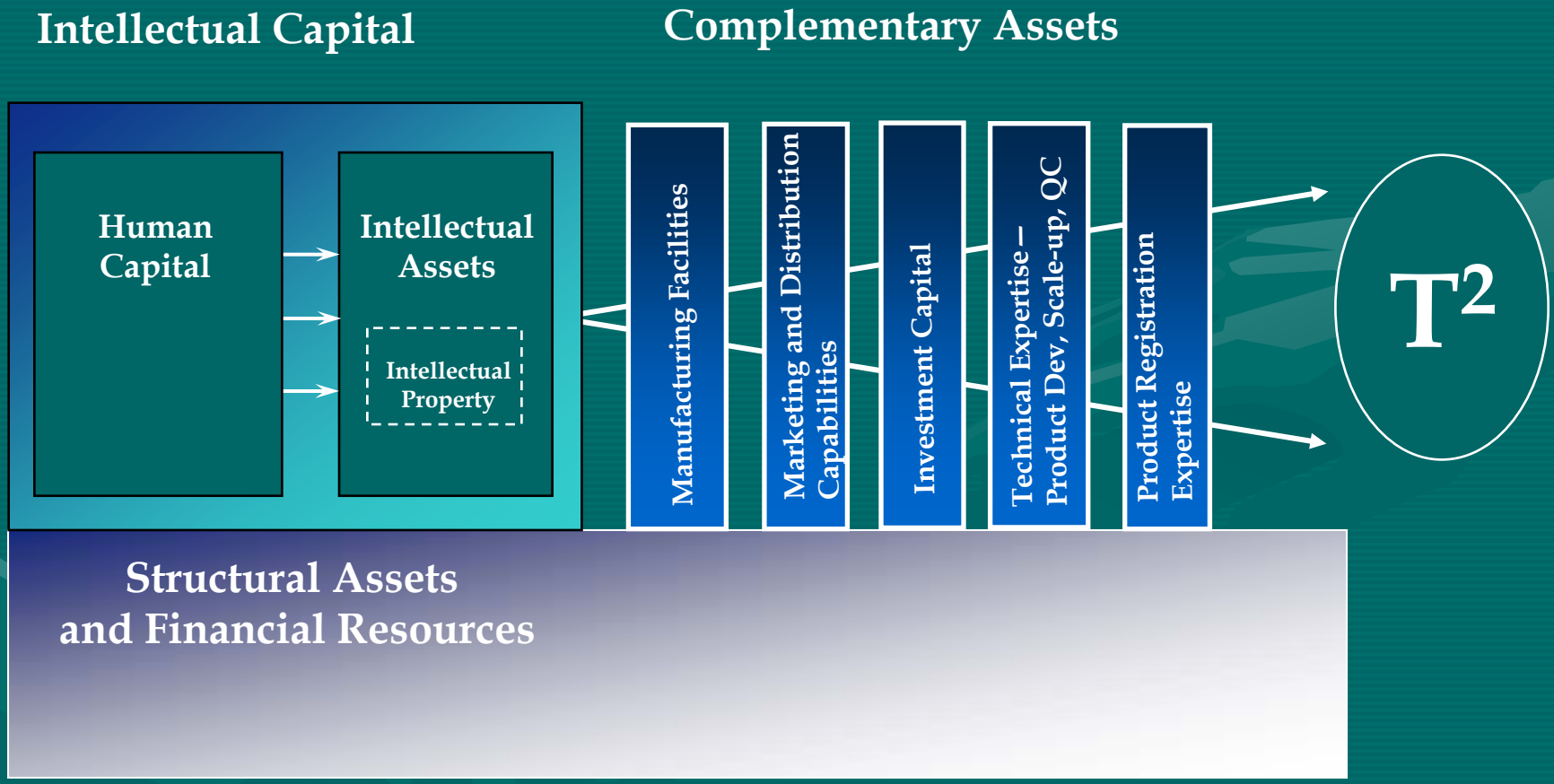
  - human capital: people, their knowledge, skills and experience

  - intellectual assets: documented know-how and protected innovations

- *Complementary assets*: manufacturing capacity, market access and distribution capacity, product registration expertise

- *Structural assets*: buildings and equipment, *financial resources*, infrastructure

A Model of a Public/Private Partnership



Operating Assumptions

- The development costs for innovative technologies are significant and the financial returns are unpredictable.
- IP protection is a *necessary incentive* for private investment in financially risky innovations.
- Private sector delivery of products and services is often the most effective and efficient means of technology transfer.
- Intellectual property protection for innovations is *available* and *enforceable*.

U.S. Technology Transfer Legislation
-- public sector, *non-federal* researchers --

Bayh-Dole Act, 1980

- ***Extramural*** **research with federal funds (university, private research firms, etc.)**
- **Right to take title to invention and license according to *institution policies & practices***
- **Rights "flow with the funds"**
- **If elect not to take title, or if patent prosecution / patent maintenance is abandoned, *rights must be returned to federal government***

U.S. Technology Transfer Legislation
-- public sector, *federal* researchers --

Stevenson-Wydler Act, 1980
Federal Technology Transfer Act, 1986 (FTTA)
National Technology Transfer and Advancement Act, 1995
Technology Transfer Commercialization Act, 2000

Intramural **research by federal employees, federally funded**

- **Special Cooperative Research And Development Agreement (CRADA) authority with private sector companies**
  - ***right to negotiate exclusive license without Federal Register notice; confidentiality of data up to 5 years***
- **Technology transfer becomes an obligation of federal scientists; royalties capped at $150K / inventor / year**
- **Extends licensing to "protectable" invention**

Impact of Landmark Legislation

Stevenson-Wydler (1980) / FTTA (1986)

Before | **After**

Discouraged; "academic independence"	**Cooperative Research with Industry Partners**	*Encouraged* (CRADA); mission priorities, relevance, impact
No incentive for USG or scientist	**Patenting**	Part of *career promotion recognition*; revenue sharing
Non-exclusive, royalty free (*little or no advantage for industry* or USG inventor)	**Licensing**	Full flexibility & right of enforcement (*strong advantage for industry* in competitive global economy)

USDA's Agricultural Research Service (ARS) Mission

To conduct research to develop ***and transfer*** solutions to agricultural problems of high national priority and provide information access and dissemination to:

- ensure high-quality, safe food, and other agricultural products
- assess the nutritional needs of Americans
- ***sustain a competitive agricultural economy***
- enhance the natural resource base and the environment, and
- ***provide economic opportunities*** for rural citizens, communities, and society as a whole.

How Does the Private Sector Access Intellectual Assets of ARS Public R&D?

Through the Office of Technology Transfer...

- ***Licensing*** current protected technologies (including plants) to private sector firms for commercial production.
- ***Cooperative Research and Development Agreements (CRADAs)*** establish research partnerships to solve industry problems.

http://www.ars.usda.gov/Business/Business.htm

Office of Technology Transfer

Coordinates Tech Transfer activities in ARS

- **Has authority to develop and sign Cooperative Research And Development Agreements (CRADAs) for ARS and to review those of other USDA agencies**
- **Has sole authority, delegated by the Secretary of Agriculture for licensing any inventions developed from intramural research within any of the USDA agencies (including Forest Service (FS), Food Safety Inspection Service (FSIS), Animal & Plant Health Inspection Service (APHIS))**

ARS Technology Transfer Policy Goals

- Use the patent system to facilitate technology transfer
- Provide an incentive for investments by the private sector
- Support small business enterprises and entrepreneurs
- Support investments by private sector partners in international markets

Federal Licensing Regulations 37 CFR 404.2

"It is the policy and objective of (this regulation) to use the patent system to promote the utilization of inventions arising from federally supported research or development."

37 CFR 404.2, paraphrased

A federally owned invention should be patented when a private sector partner is needed to achieve technology transfer

and

that partner requires some scope of exclusivity to protect the capital investments needed to commercialize the invention.

Public / Private Partnerships: Licensing of USDA Inventions

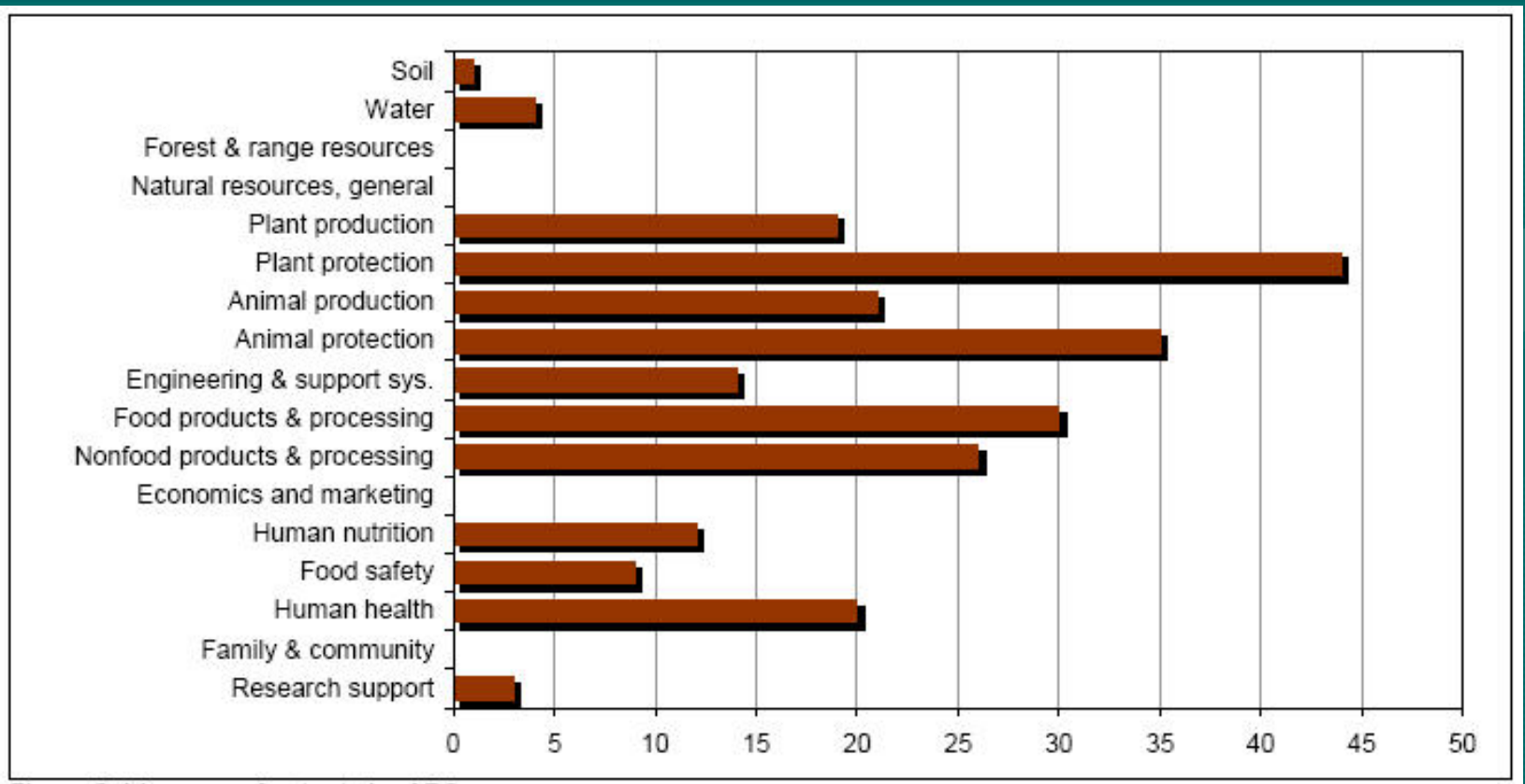


Figure 2. Licenses of patents by ARS.

Note. Patents may be licensed more than once. Patents may be captured in more than one category. Data from Day Rubenstein (2003).

Public / Private Partnerships: Relationship to Social Benefits

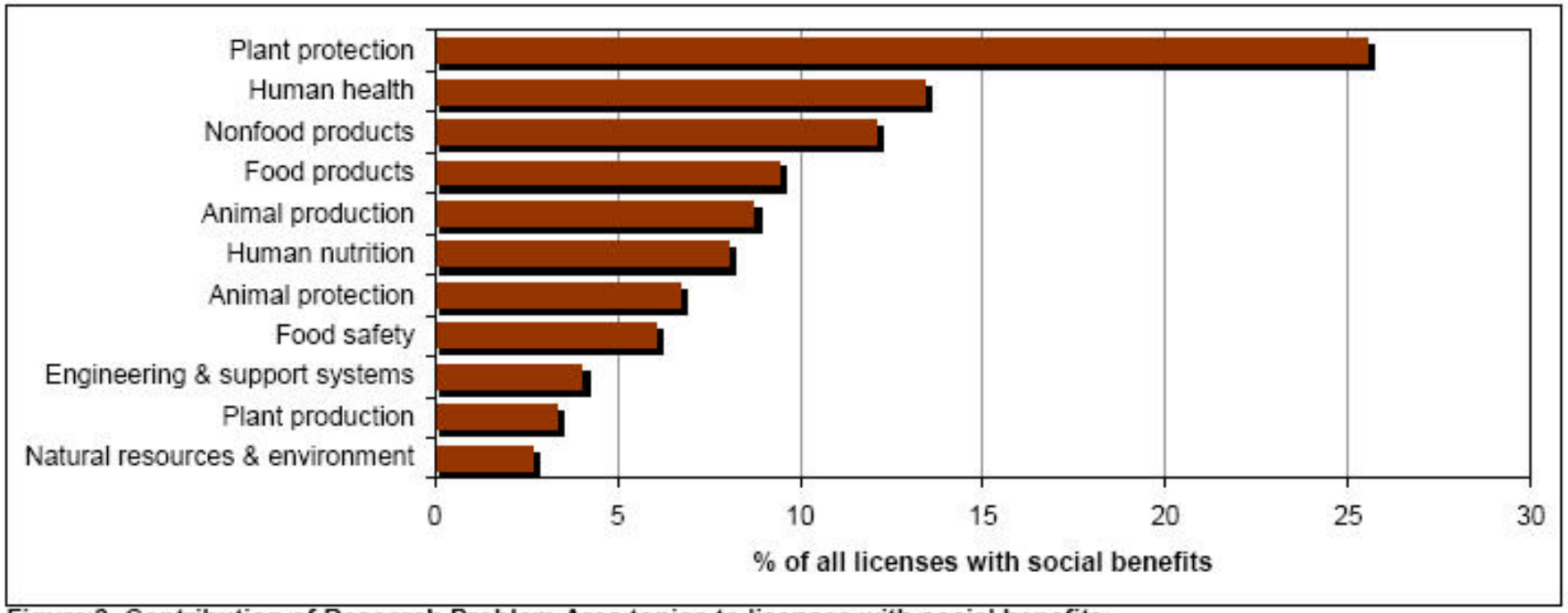


Figure 3. Contribution of Research Problem Area topics to licenses with social benefits.

Note. Data from Day Rubenstein (2003).

Public / Private Partnerships: Relationship to Social Benefits

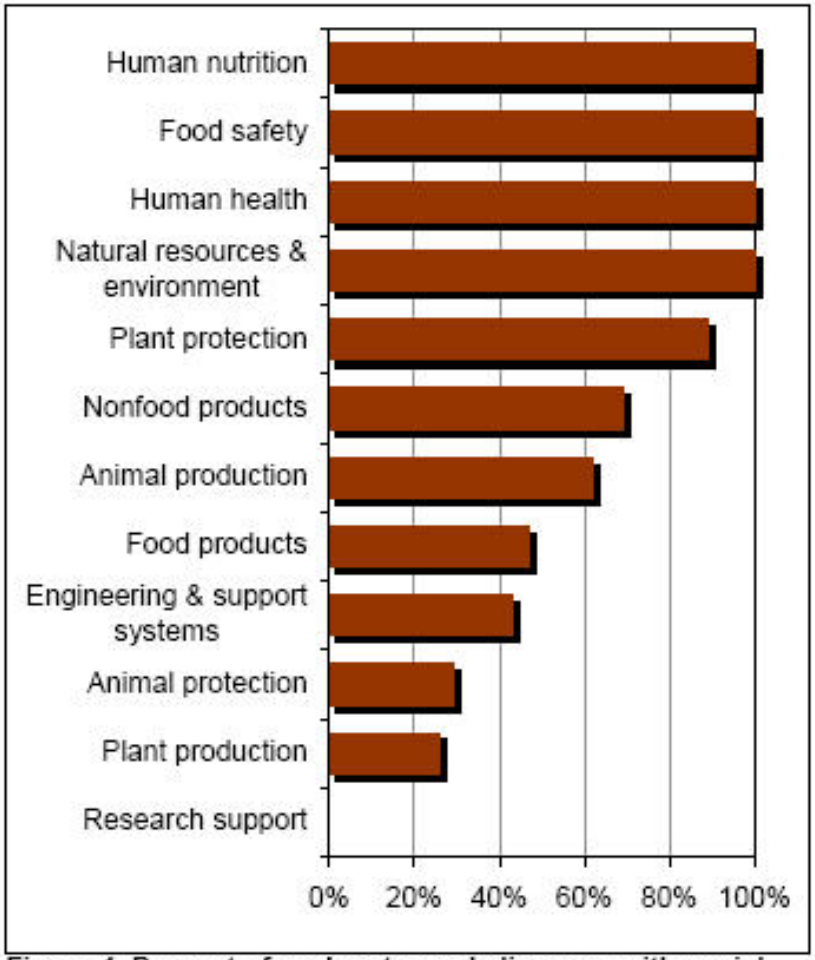


Figure 4. Percent of each category's licenses with social benefits.

Note. Data from Day Rubenstein (2003).

Public / Private Partnerships: Cost Sharing in CRADAs

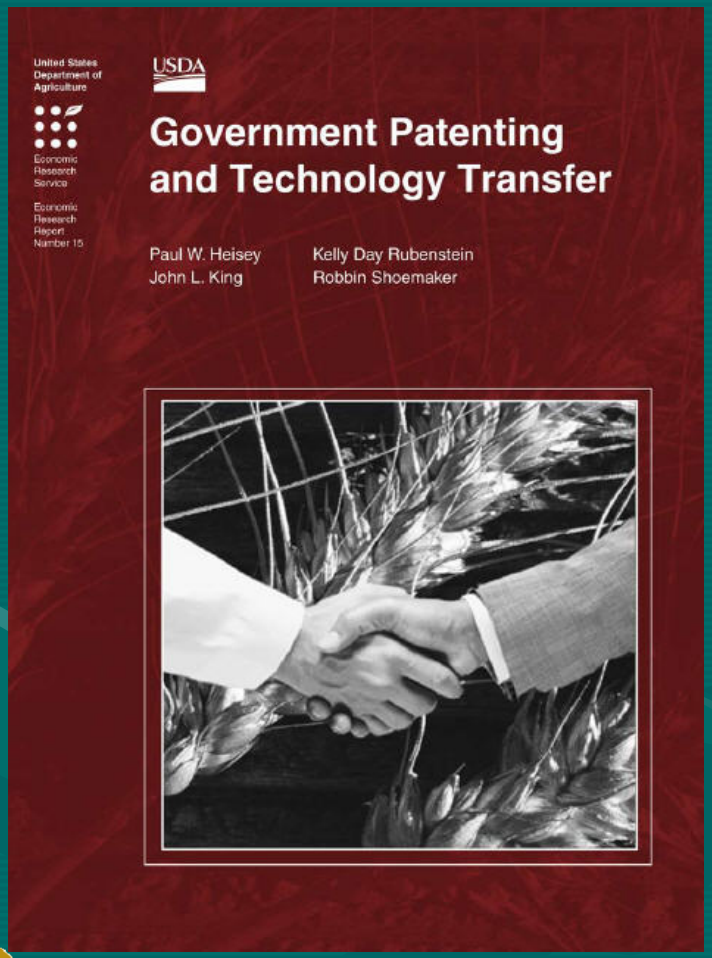
Table 2. Public and private contributions to costs of joint research.

Technology area	Public contribution	Private contribution[a]
	Share of row *total (%)*	
Postharvest utilization of agricultural commodities	36.6	63.4
Plants	33.4	66.6
Animals	36.5	63.5
Natural resources	40.2	59.8
Human nutrition and well-being	52.0	48.0
All research	36.1	63.9

[a] *Private contribution includes grants given to ARS and in-house research conducted by private-sector partner in support of the CRADA project. Contribution based on the value of resources contributed to 366 CRADA agreements between USDA and outside cooperators between 1987 and 1995 (out of a total of 528 CRADA projects during this period.)*
Note. Data calculated from ARS databases.

The Question Posed by USDA's Economic Research Service

Does ARS IP Management Promote or Inhibit Technology Transfer?



Conclusions …

- **Intellectual property rights, such as patents, protect new inventions from imitation and competition. A patent's major objective is to provide incentives for invention, sacrificing short-term market efficiency for long-term economic gains.**

The Question Posed by USDA's Economic Research Service

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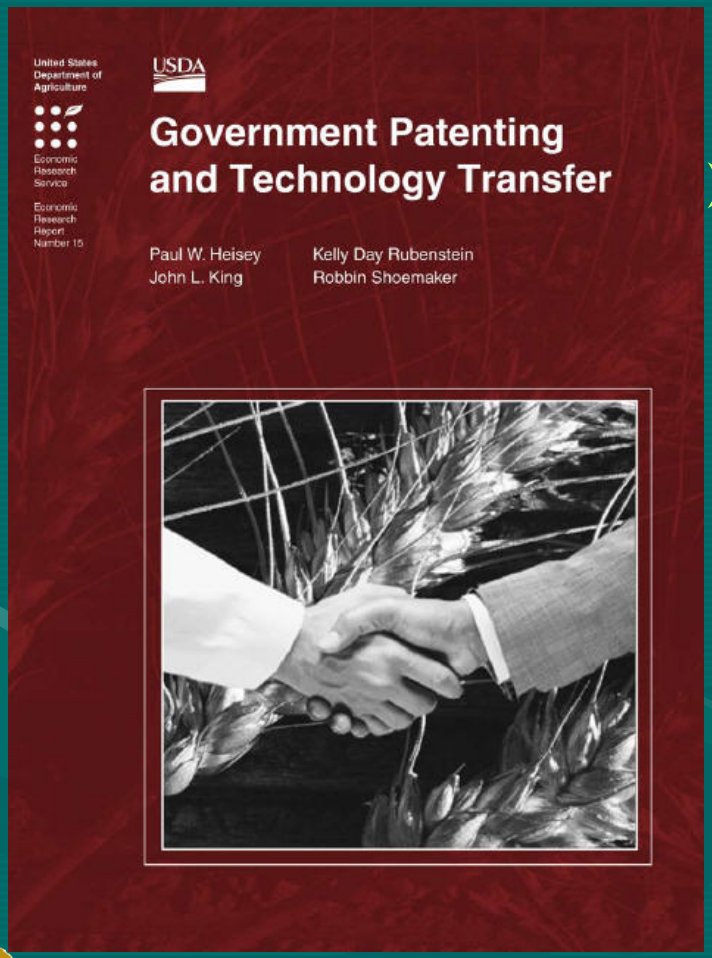

Conclusions …

- **More widespread use of patenting and licensing by ARS has not reduced the use of traditional instruments of technology transfer such as scientific publication**

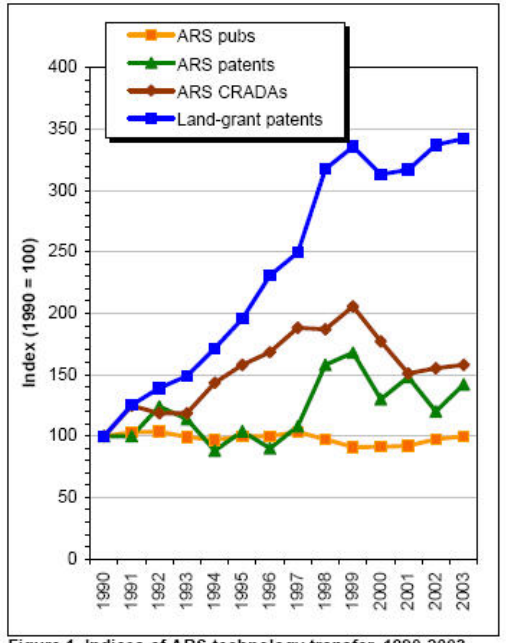

Figure 1. Indices of ARS technology transfer, 1990-2003.
Note. Data from ERS analysis of data from ARS; CSREES; USPTO; Institute for Scientific Information Current Contents.

The Question Posed by USDA's Economic Research Service

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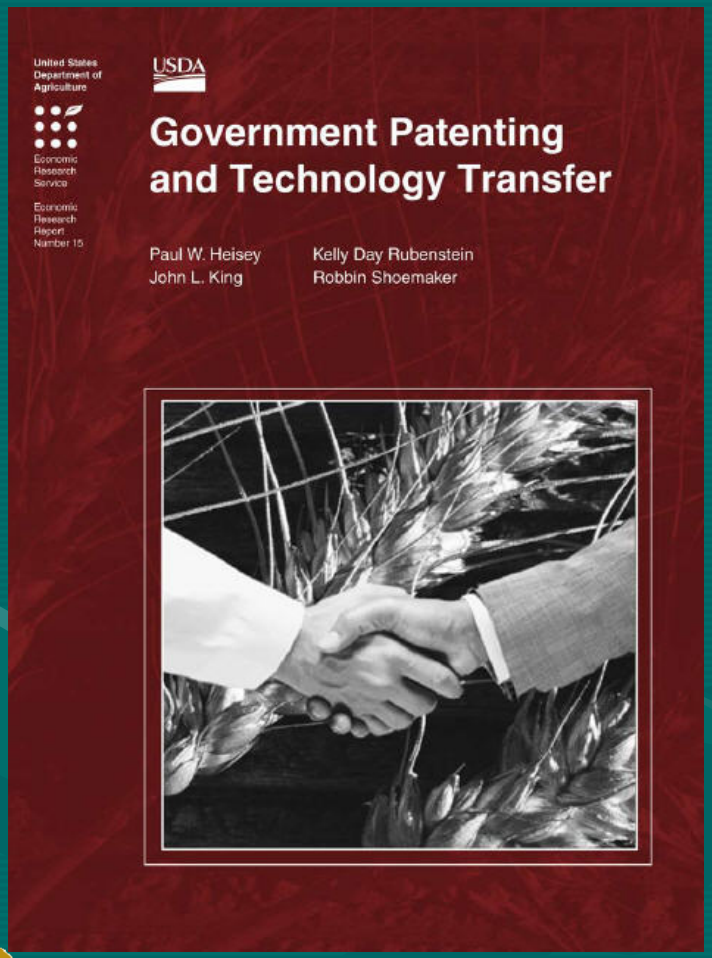


Conclusions …

- **As commercial partners gain experience with the technology and learn more about the market, mutually advantageous revisions to license terms can maintain the incentives through which private companies distribute the benefits of public research.**

Models for Developing and Transferring Technologies to the Private Sector

Background Invention
(developed in USDA)

Seek Private
Sector Interest
For Commercialization

Marketing Section

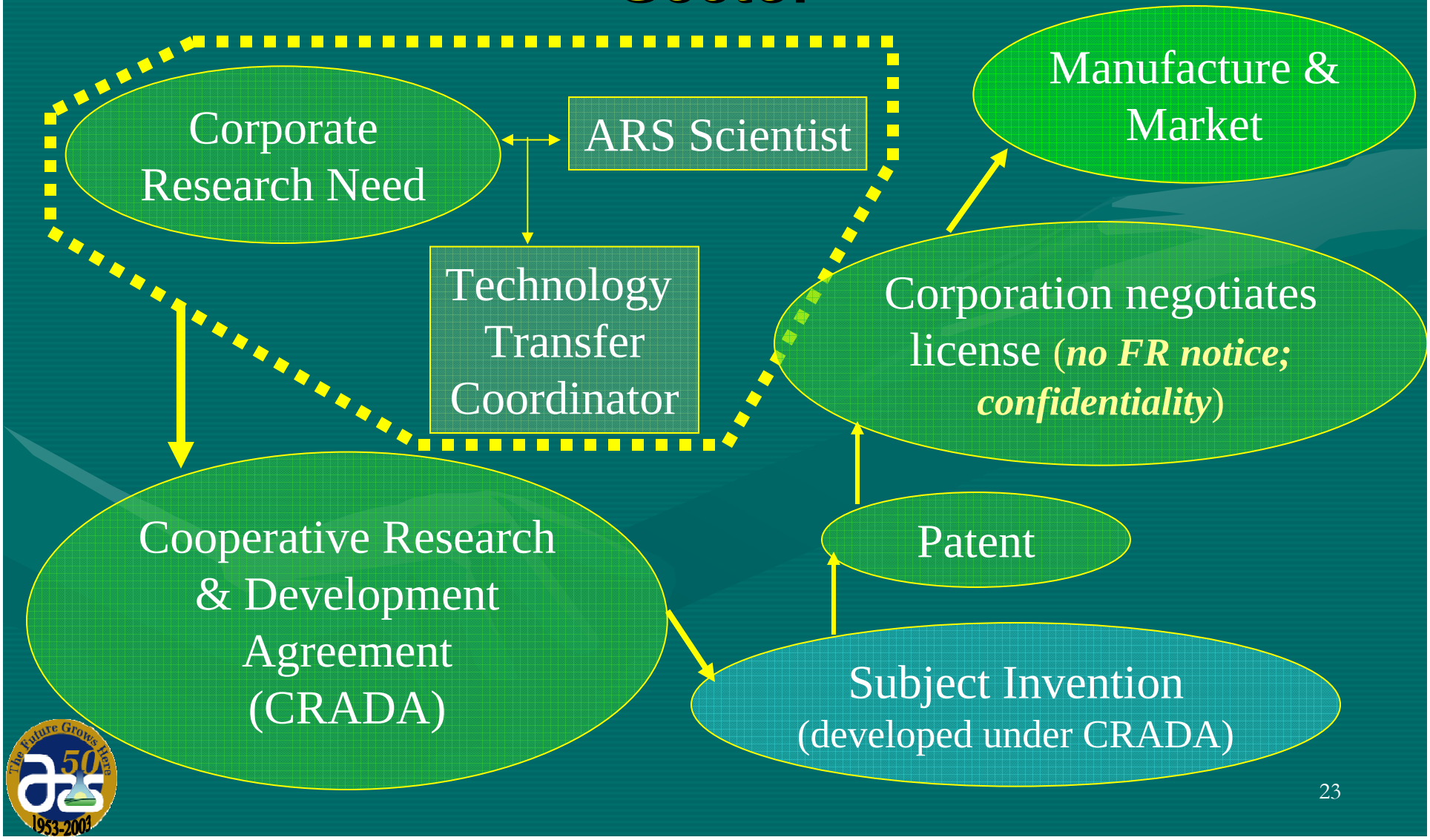
- Creates summary for web
- Targets industry

Federal Register Notice

Licensing Section

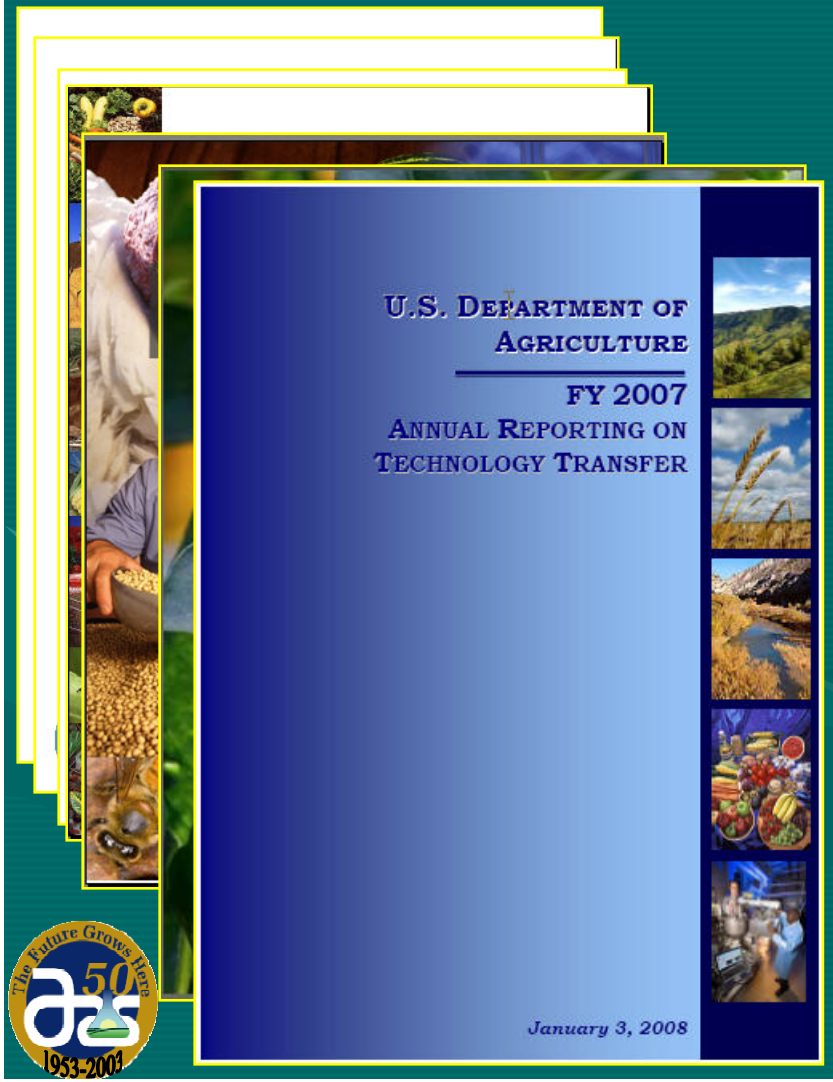
Corporate response

The CRADA Model for Developing and Transferring Technologies to the Private Sector



Technology Transfer: *the adoption of research outcomes for public benefit*

Annual Report to Congress on Technology Transfer --- "Downstream Outcomes"



Biobased Products

Domestic production of hypoallergenic rubber -- Natural rubber is a strategic raw material used in over 40,000 applications. The United States consumes over 20% of the world supply of natural

Crop Production and Protection

Novel sweetener reaches market -- ARS researchers at the USDA/ARS Bioproducts and Biocatalysis Research Unit at the National Center for Agricultural Utilization Research (NCAUR), in Peoria, IL, are working in partnership with Cargill on the use of enzymes to convert sugar and corn syrup to value-added complex carbohydrates. Using ARS-developed methods to produce and characterize novel carbohydrate products from agricultural materials, ARS and Cargill surveyed more than 100 microbial isolates from culture collections and natural isolations. This research led to the discovery of a novel low-glycemic index sweetener, called Xtend™ sucromalt. The new product provides food and beverage customers with a natural and slow release carbohydrate syrup. This fully digestible, low glycemic syrup provides natural sweetness for products such as nutritional beverages and bars, cereals, ice cream, jams and jellies, and yogurts. The product is named sucromalt because it is derived from a combination of sucrose (cane or beet sugar) and maltose (corn sugar).

The Low Glycemic Index Sweetener Team of Gregory Cote, Timothy Leathers, Melinda Nunnally, and Sheila Maroney (Midwest Area, Peoria, IL), Ting Carlson and Anton Woo (Cargill, Inc) won a 2007 Superior Effort ARS Technology Transfer Award for this work.

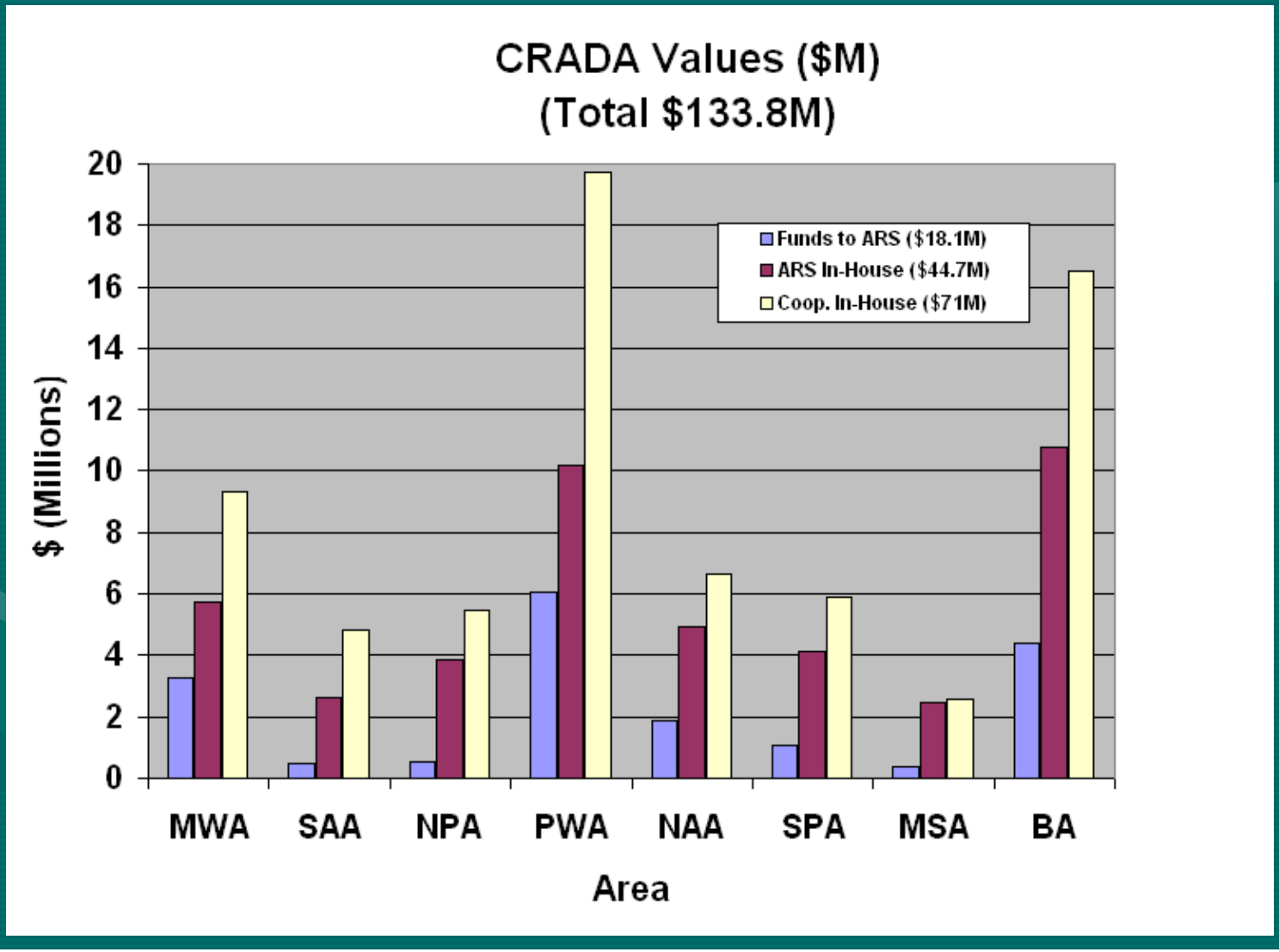
Annual Report to Congress on Technology Transfer --- FY 2007 License Metrics

- Licenses:
  - Active: *339 (130 with universities)*
  - New in 2007: 25
  - Biological Materials: 22 (5 new in 2007)
- Licenses with products on market: *108 (28 from university co-owned inventions)*
  - 30 are plant materials (plant patent or Plant Variety Protection Certificate)

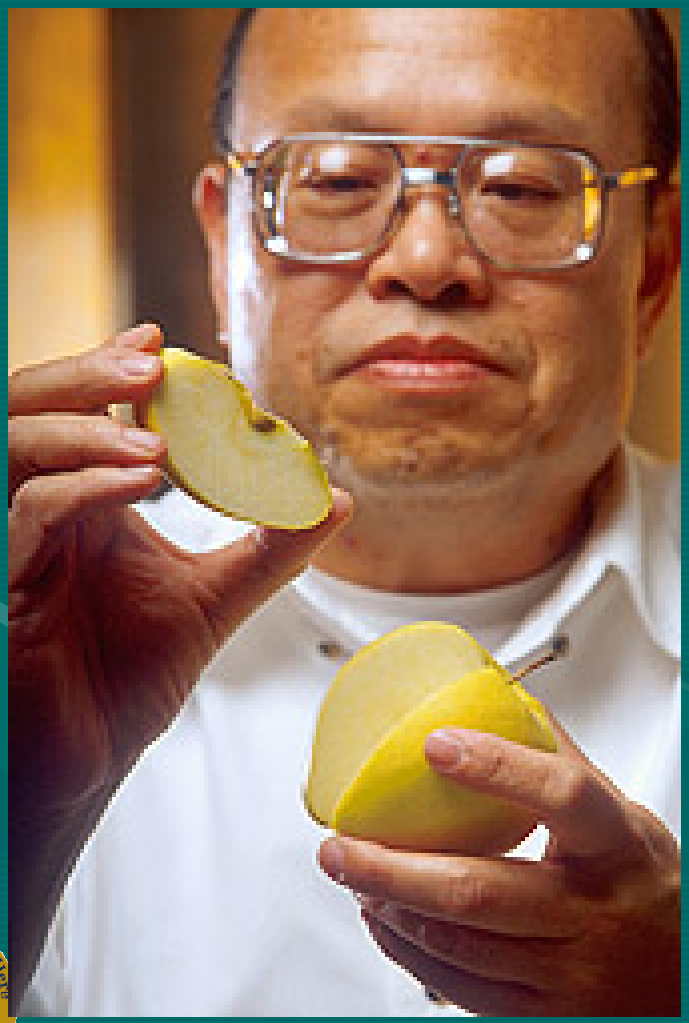
Annual Report to Congress on Technology Transfer --- FY 2007 CRADA & Patent Metrics

- CRADAs:
  - Active: 207
  - New: 55
  - Amended: 77
- Material Transfer Agreements: 788 (564 outgoing)
- Invention Disclosures: 116
- Patent Applications Filed: 105
- Patents Issued: 36

Annual Report to Congress on Technology Transfer --- FY 2007 CRADA Value



Current Technologies In Successful Commercialization …



Preserving color, crispness, and flavor of fresh cut apples --- “Apple Dippers”® (Attila Pavlath / Dominic Wong)

Mantrose-Hauser (license,

Current Technologies In Successful Commercialization

…

100% natural fruit bars from fruit puree (Tara McHugh)

HR Mountain Sun; “Gorge Delights” (license, CRADA)

Current Technologies In Successful Commercialization

- Helping people with peanut allergies: “Sunbutter”® (Harmeet Guraya / Isabel Lima)
- Red River Commodities (CRADA)

Current Technologies on the Road to Success …

George Inglett (Oatrim, Z-trim, Nutrim, Calorie-trim)

Current Technologies In Successful Commercialization

...

Table grape varieties -- (David Ramming)

California Table Grape Commission

(license & infringement)

Current Technologies In Successful Commercialization

eMERGE

VerifEYE™ Food Safety Technology

emergeinteractive.com

Tom Casey, Mark Rasmussen
Jacob Petrich (Iowa State U.),

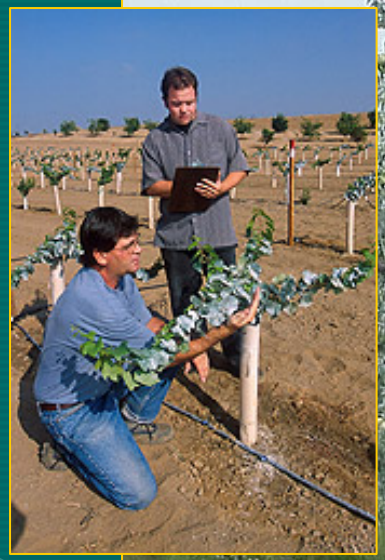
(CRADA)

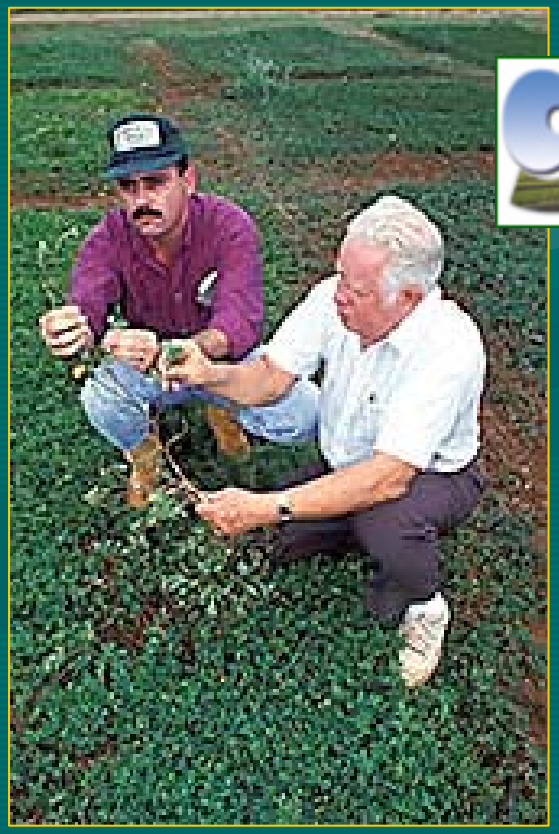
Current Technologies In Successful Commercialization

Biodegradable soy-based hydraulic fluid (Sevim Erhan; test with National Park Service)

- Licensed exclusively to Agrilube / Bunge (Feb 2006)
- First sale in March, 2006.

Current Technologies In Successful Commercialization





afla-guard

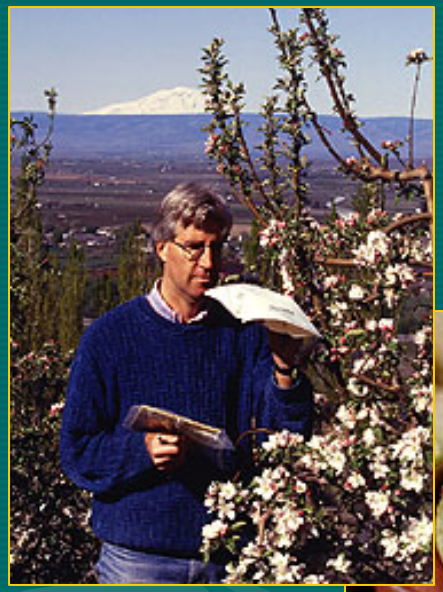
Aflatoxin control in peanuts

Kaolin (clay); pest protection

CIRCLE ONE GLOBAL afla-guard

Current Technologies In Successful Commercialization

...



TRÉCÉ INCORPORATED

Codling Moth Kairomone and Pheromone (CRADA, patents, licenses)

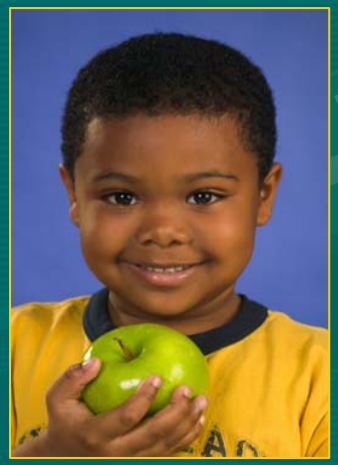
Technology Transfer: *Successes from Crop Protection and Quarantine*

Based on ARS research outcomes, FDA approves Tylan Soluble (Elanco Animal Health) for controlling American foulbrood disease in honey bees (know-how; public sector data from 'intellectual assets')

Technology Transfer: *Successes from Crop Protection and Quarantine*

Enhancing Trade

APHIS accepts ARS findings and establishes Final Rule for lower generic phytosanitary radiation treatment for fruit flies; lower cost, decreased treatment time, more competitive in global markets.



ARS demonstrates apples from U.S. won't vector fire blight to other nations; WTO rules in favor of U.S., Japan opens market to U.S. apples.

U.S. University Technology Transfer FY 2005 Metrics

- 628 new businesses were created and 527 new commercial products were launched based on innovations developed at U.S. universities, largely with Federal funds
- 4,932 new licenses; 28,349 active licenses among AUTM* reporting institutions
- >$42 B in R&D at member U.S. academic centers

**Source: Association of University Technology Managers (AUTM)* http://www.autm.net; metrics reflect 151 institutions responding to 2005 survey

AUTM now provides "Better World" reports to highlight selected outcomes

U.S. Biotechnology Transfer Policy Outcomes
(arising from federal & private sector R&D investments)

- As of Dec. 31, 2005, there were 1,415 biotechnology companies in the U.S. (329 publicly held) with health-care revenues of $50.7 B.
- The market capitalization of the publicly traded companies was $410 B
- The U.S. biotechnology industry employed 198,300 people as of December 2003.

Source: Biotechnology Industry Organization (BIO) http://www.bio.org

How to Facilitate Knowledge of "…who owns what, who can exploit what…"

Build IP management *technical* capacity (i.e., *professional services* to meet both public and private needs)

- Public Intellectual Property Resources in Agriculture (PIPRA)
  - Assists in accessing IP for developing nations and small businesses (freedom to operate)
- US-India Agricultural Knowledge Initiative (USAID funded through Michigan State University)
  - IP training and capacity building

<u>Key message</u>: Model intellectual asset management policies (USDA) that promote economic activity

Public Sector Intellectual Assets: Benefits to Society and Economic Activity

- Availability of new products and services *(innovation from R&D investments)*
- Less expensive or improved products and services *(innovation from R&D investments)*
- Creation or retention of local jobs
- Promotes / sustains entrepreneurial activities
- Downstream impacts on other businesses providing supporting products or services
- Impacts on the quality of life for consumers

United States Department Of Agriculture
Agricultural Research Service

Photo: Quiet Waters Park, Annapolis, MD
(Joann Perkins)

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http://www.ars.usda.gov/Business/Business.htm

United States Department Of Agriculture
Agricultural Research Service

Postings for UN Website

- AUTM 2008 Better World Report Part1.pdf
- AUTM 2008 Better World Report Part 2.pdf
- BEA–07–48 R&D spending 07 and GDP.pdf
- Can Technology Transfer Help Public-Private Sector Do More with Less The Case of the USDAs Agricultural Research Service.pdf
- Government Patenting and Technology Transfer.pdf
- USA Today 5June08 Bayh-Dole helps US compete.pdf
- USDA FY2007 Tech Tran Annual Report FINAL


Photo: Quiet Waters Park, Annapolis, MD (Joann Perkins)

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