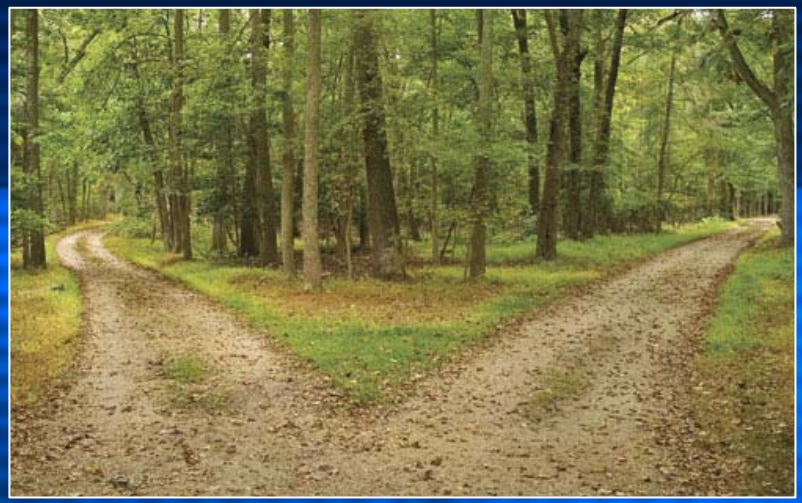

Agricultural Systems Research: How Will We Know Alternative Has Become Conventional

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Agricultural System Competitiveness & Sustainability
National Program Staff
USDA Agricultural Research Service
Beltsville, MD

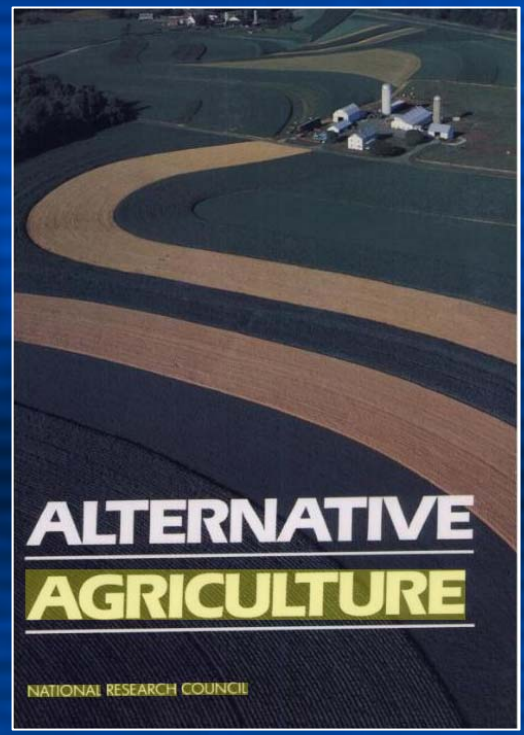
Agricultural Systems Research: How Will We Know Alternative Has Become Conventional

Today's Presentation

- Brief assessment of progress since the last review.
- Suggestions for where to go from here.
- Evolving systems research approaches and solutions examples.

Preface from Alternative Agriculture National Research Council, 1989

- Farms and rural communities in economic decline.
- Record levels of government support.
- Pesticides and nitrates in ground water.
- Pesticide and hormone residues in food.
- Soil erosion, salinization, and aquifer depletion.



Patterns of Rural Population Change, 1990-1995 versus 1995-2000

- Farms and rural communities in economic decline.
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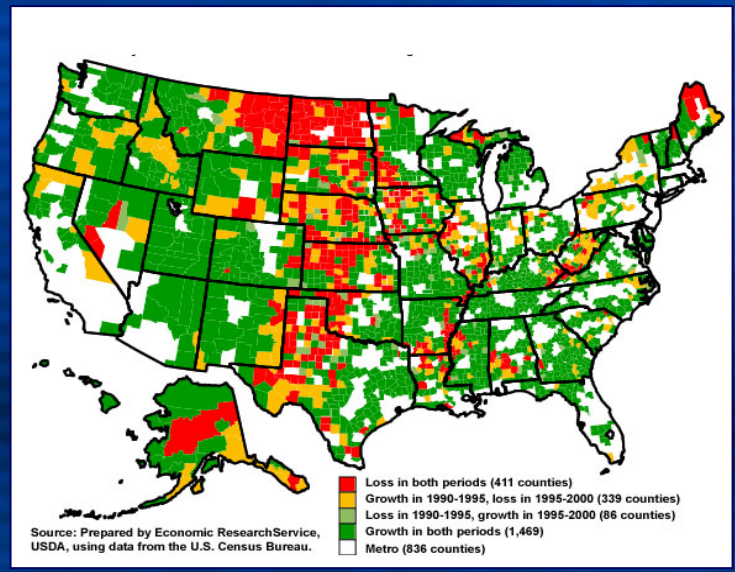

USDA-ERS

32% of rural county populations have declined

Ratio of Government Payments to Gross Cash Farm Income, 2005

- Farms and rural communities in economic decline.
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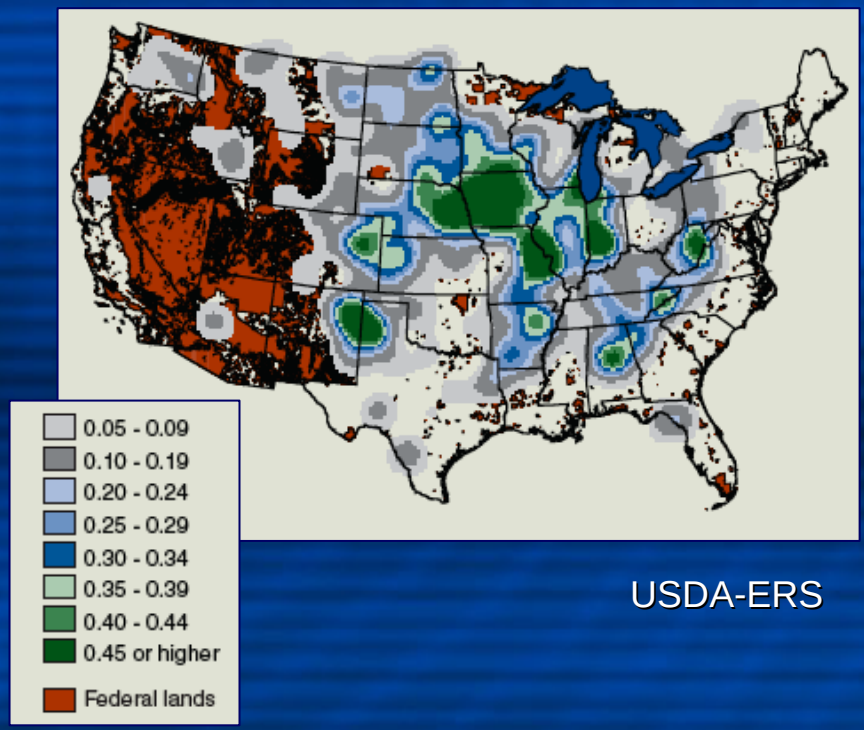

USDA-ERS

USDA Pesticide Data Program Annual Summary, 2005

- Farms and rural communities in economic decline.
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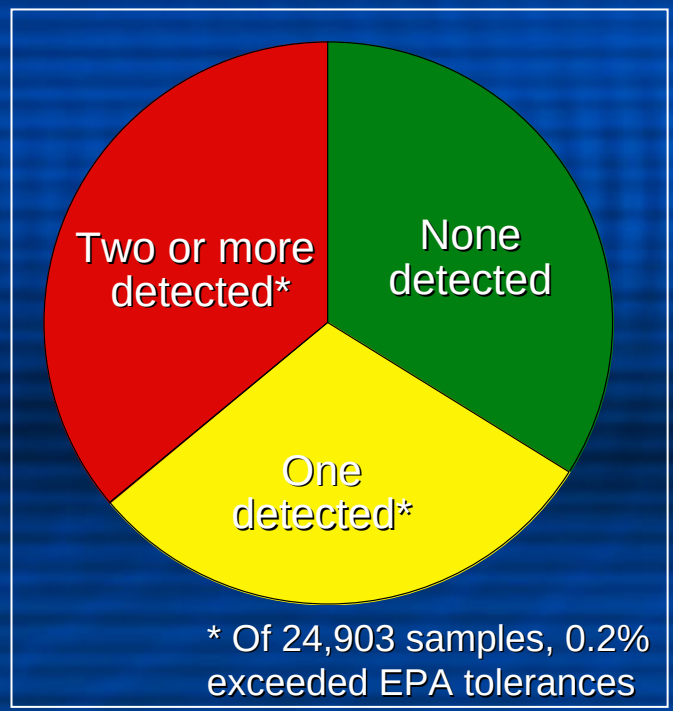

USDA-AMS

Change in Pounds of Pesticides Applied, Average from 1972-74 to 1996-97

- Farms and rural communities in economic decline.
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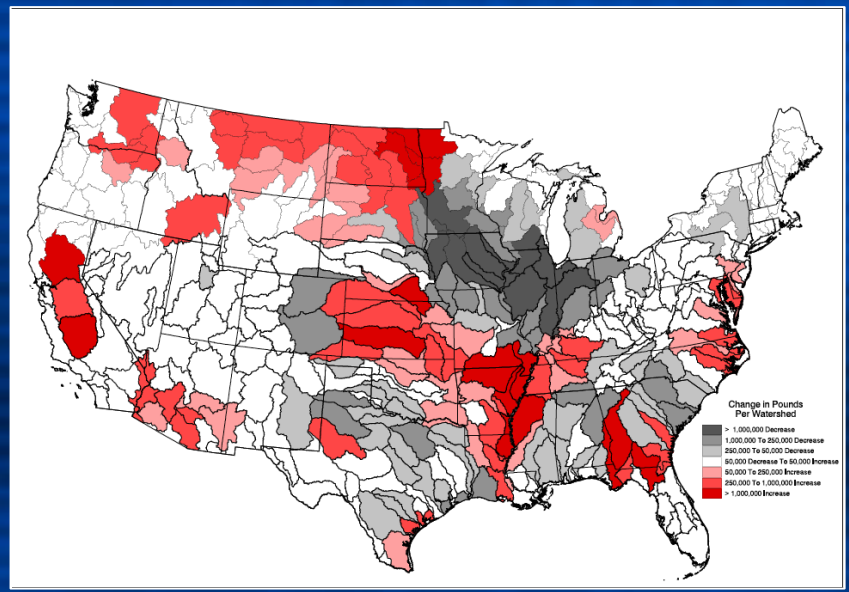

USDA-NRCS

Pesticide use is steady or declining, IPM and alternative management increasing

Change in Average Annual Soil Erosion by Water on Cropland and CRP Land, 1982-1992

- Farms and rural communities in economic decline.
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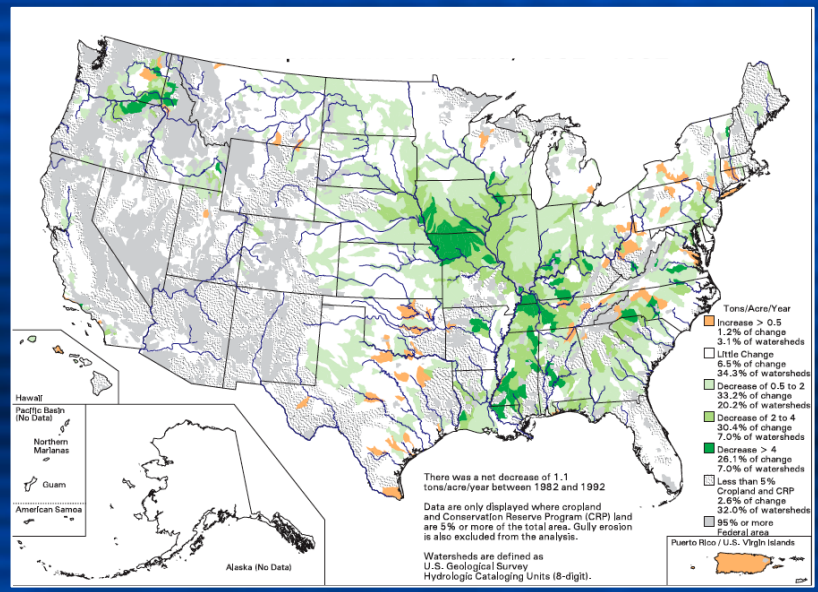

USDA-NRCS

Reduced soil loss: 7.4 to 5.6 tons per acre per year
Conservation and no-till use increased 15%

Freshwater Consumption as a Percentage of Local Average Annual Precipitation

- Farms and rural communities in economic decline.
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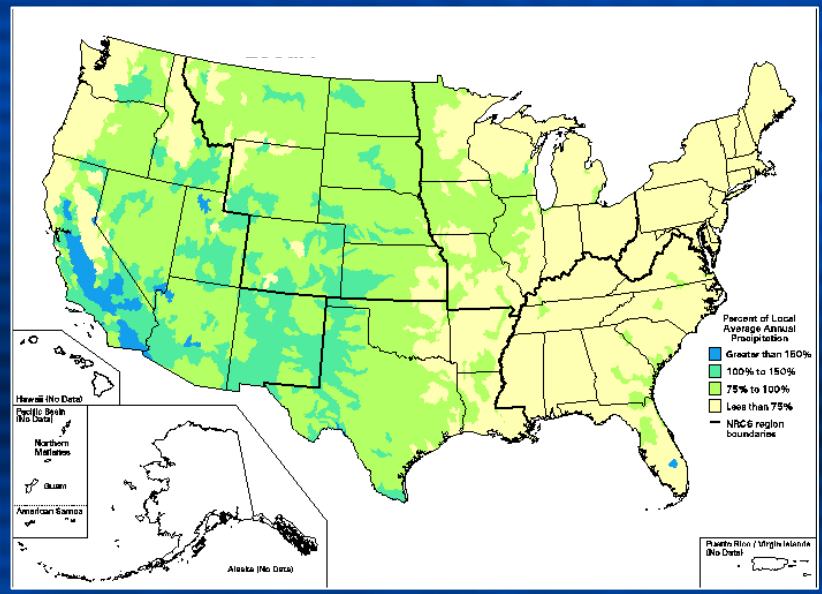

USDA-NRCS

General continued decrease in groundwater levels
Since 1998: Gravity flow -14%, Sprinkler +9%, Low flow +36%

Percent Change in Resident Population, 1990 to 2000

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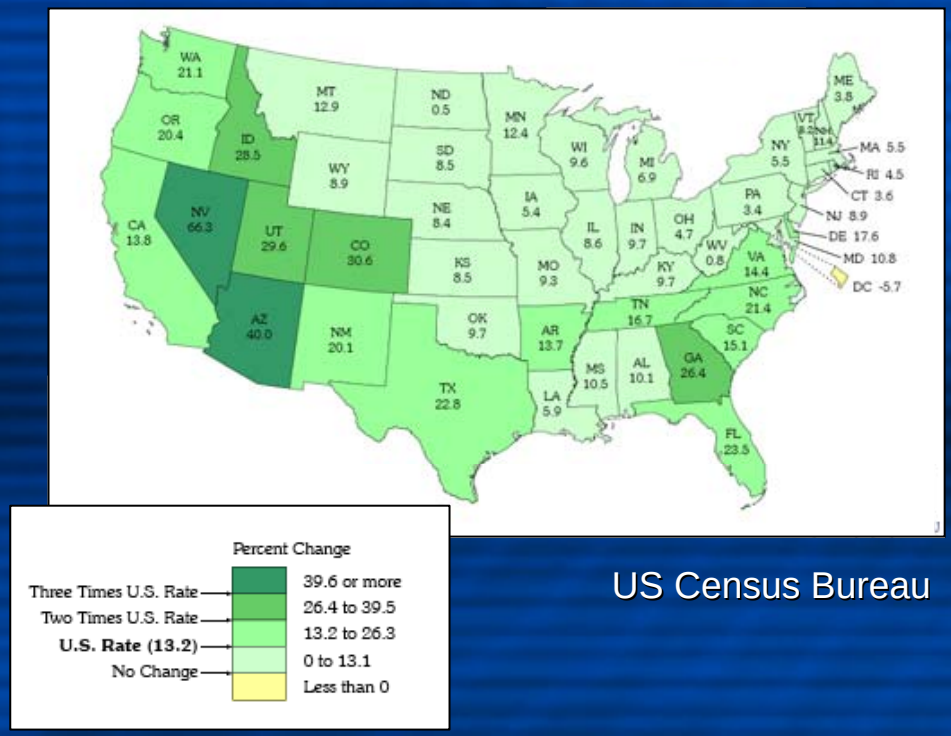


US Census Bureau

Expect continued urban-rural water use conflicts

Agricultural Systems Research: How Will We Know Alternative Has Become Conventional

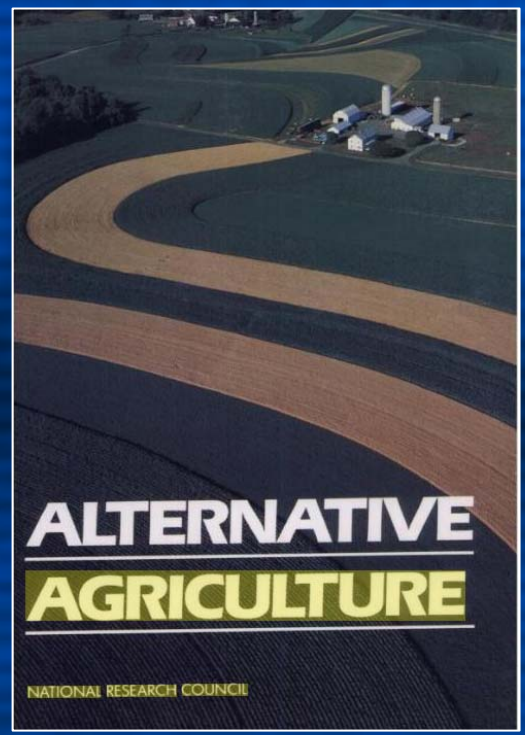
Percentage Use as a Measure of Approaching the Goal

Conservation tillage	11 - 69
Scout for pests	55 - 92
Efficient irrigation methods	56
Advanced irrigation scheduling	20
Crop rotations	27 - 84
Cover crops	11*
Information technology	16 - 75

Agricultural Systems Research: How Will We Know Alternative Has Become Conventional

Suggestions for Where to Go From Here

- Aggressive discovery of where to use and how to implement what-we-already-know that works.
- Re-assess the changing economic-biophysical-social landscape and its challenges.
- Determine how new technologies and solutions could fit in.
- Re-think who can contribute to agricultural research partnerships.

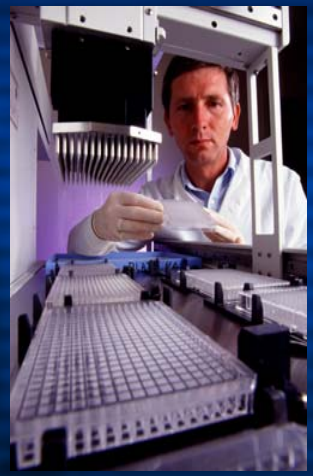


Aggressive discovery of where to use and how to implement what-we-already-know that works.

National Agricultural Library - Alternative Farming Systems Information Center

- Source for USDA sustainable and organic agriculture information.
- Tools to access reliable high quality information on alternative and organic-related topics.
- Creates topical bibliographies and resource guides.
- Digitizes historic USDA publications.
- Directly answers customer questions.

Aggressive discovery of where to use and how to implement what-we-already-know that works.



Plants recognize organic nutrients
Beltsville, MD

Identify genetic plant growth efficiency mechanisms and combine with soil fertility strategies to increase crop productivity.

Develop whole-system preventative strategies as first-line defenses against disease and insect pests, and therapeutic controls as rescue practices.

Salinas, CA

Weed and insect management

Beltsville, MD

Aggressive discovery of where to use and how to implement what-we-already-know that works.

Biophysical impact modelling of agricultural production and natural resources processes.

- Identify optimal multiple objective production solutions for multifunctional agricultural landscapes.
- Predict the effects of management and changing climate on crop yield.
- Predict the effects of production on natural resources processes and quality.

Re-assess the changing economic-biophysical-social landscape and its challenges.

Invigorating the Maine Potato Industry

- Finding profitable crop rotations for potatoes.
- Breeding new varieties for specific end uses and durable disease resistance.
- Developing soil management practices to increase yield and decrease plant stress.
- Improved disease and insect management practices.

USDA-ARS
Orono, ME

Re-assess the changing economic-biophysical-social landscape and its challenges.

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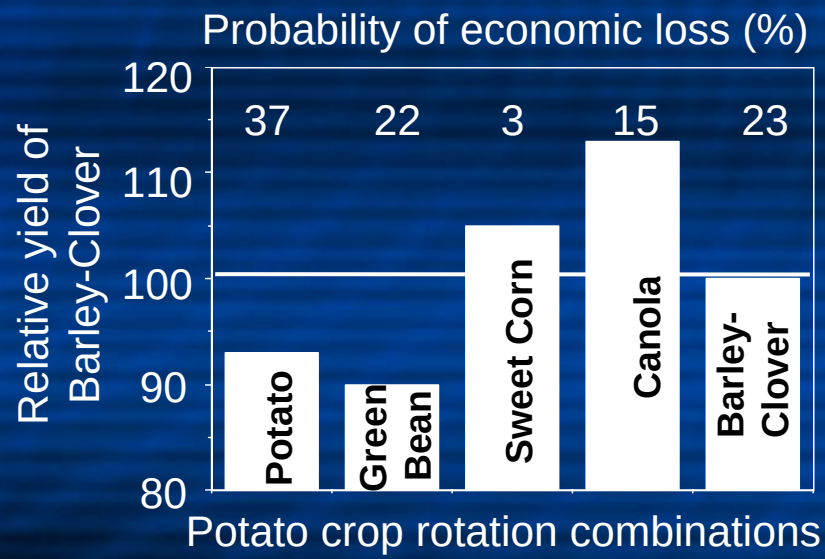

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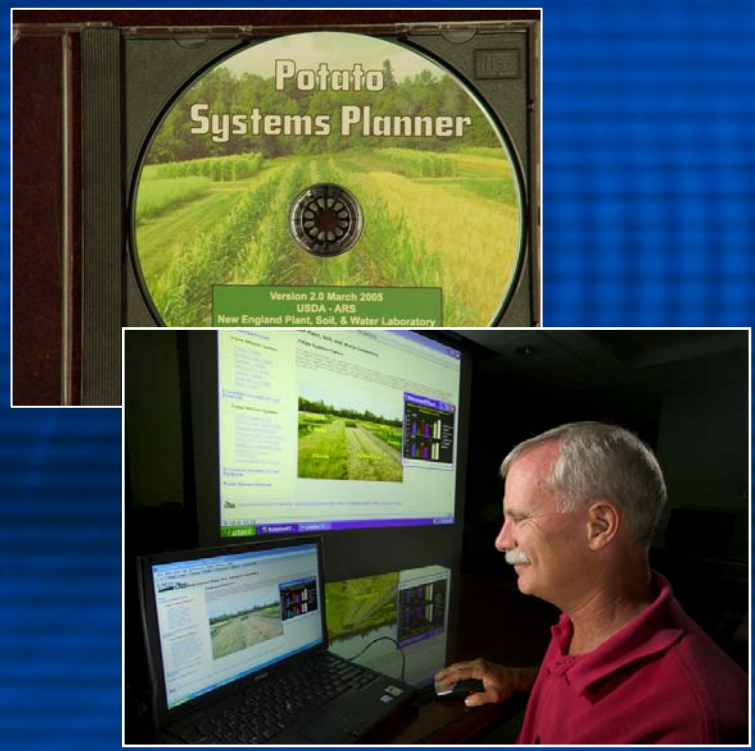


Management Decision Tools

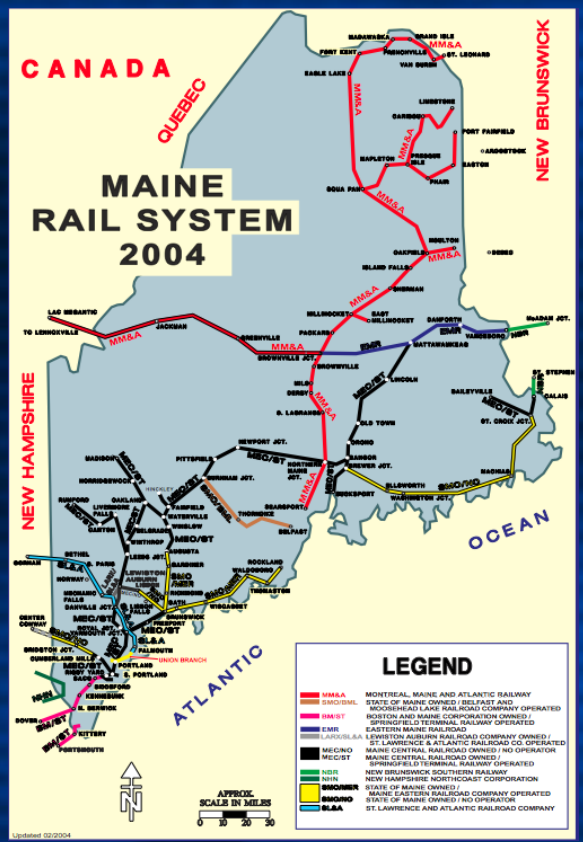
Re-assess the changing economic-biophysical-social landscape and its challenges.

Invigorating the Maine Potato Industry

- Identified profitable crop rotations for potatoes, but there are no market outlets.
- Collaborate with USDA-AMS to define markets, capacity, and product quality required for new markets.
- Work with USDA-Rural Development to demonstrate need for a cooperative and develop a business plan supporting infrastructure loan guaranties.

Re-assess the changing economic-biophysical-social landscape and its challenges.

Invigorating the Maine Potato Industry



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Unexpected challenges, not related to production or markets

Determine how new technologies and solutions could fit in.

Scalable Energy Producing Technologies

Catalytic Hydrothermal Reactor:

- Synthesis gas from manure slurry.
- Catalyst and steam reformation conversion to methane.

Microchannel Fischer-Tropsch reactor:

- Liquid fuel production from synthesis gas.
- Convert synthesis gas from 6 to 1,000 tons of biomass/day.

Re-think who can contribute to agricultural research partnerships.

Government-Private Partnerships

- Agricultural Research Service
- Maryland Technology Development Corporation
- Renewable Carbon Management, LLC

Capital Mall Cafeteria Waste Utilization

Re-think who can contribute to agricultural research partnerships.

Government-Private Partnerships

- Agricultural Research Service
- Maryland Technology Development Corporation
- Renewable Carbon Management, LLC

Swine Manure Lagoon Replacement Technology

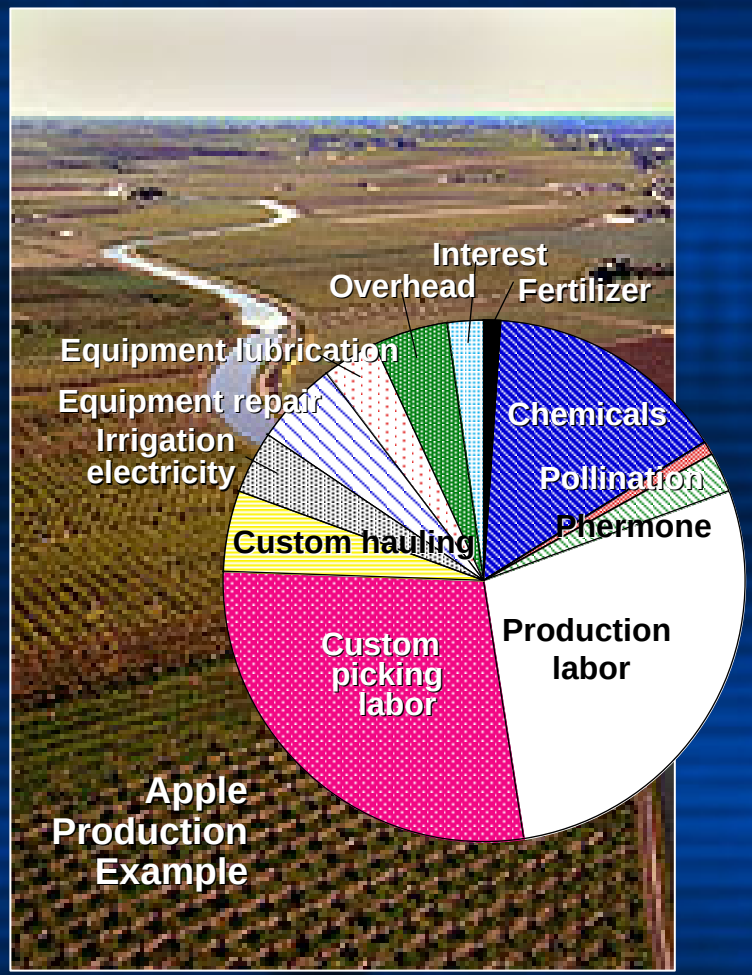
- Agricultural Research Service
- North Carolina Dept. of Justice
- Super Soil Systems USA, Inc

Re-think who can contribute to agricultural research partnerships.

New Configurations of Technologies

Waste-Energy-Recycling

Re-think who can contribute to agricultural research partnerships.



New Configurations of Technologies and Partners

- Agricultural industries
- USDA Agencies
- Land Grant Universities
- Non-traditional universities: Carnegie Mellon, MIT
- Non-agriculture Agencies: NASA
- Non-agriculture technology providers