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Conservation Programs: Understanding the Role for Economics and Opportunities for Improvement

Susan Capalbo (presenter)

*JunJie Wu and Beau Olen
Applied Economics, Oregon State University*

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Track: Conservation
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Takeaways:

- Conservations programs are **economic** products that can be better designed to meet sustainability needs and create opportunities
- Programs must be economically viable to growers, based on science
- Track record for CRP: total benefits exceed total taxpayer cost
- Smaller CRP in 2014, important to target CRP spending

But we can do better:

- Focus on **improving performance** and **build in more flexibility**
- Incorporate **spatial difference** --economics/biophysical conditions
- Use **information, technology & smart decision tools** to track performance and link growers and policy designers
- Big, Smart, Green (Wired)

Major Conservation Programs in the 2008 US Farm Bill

Land Retirement

- Conservation Reserve Program (CRP)
- Wetlands Reserve Program (WRP)

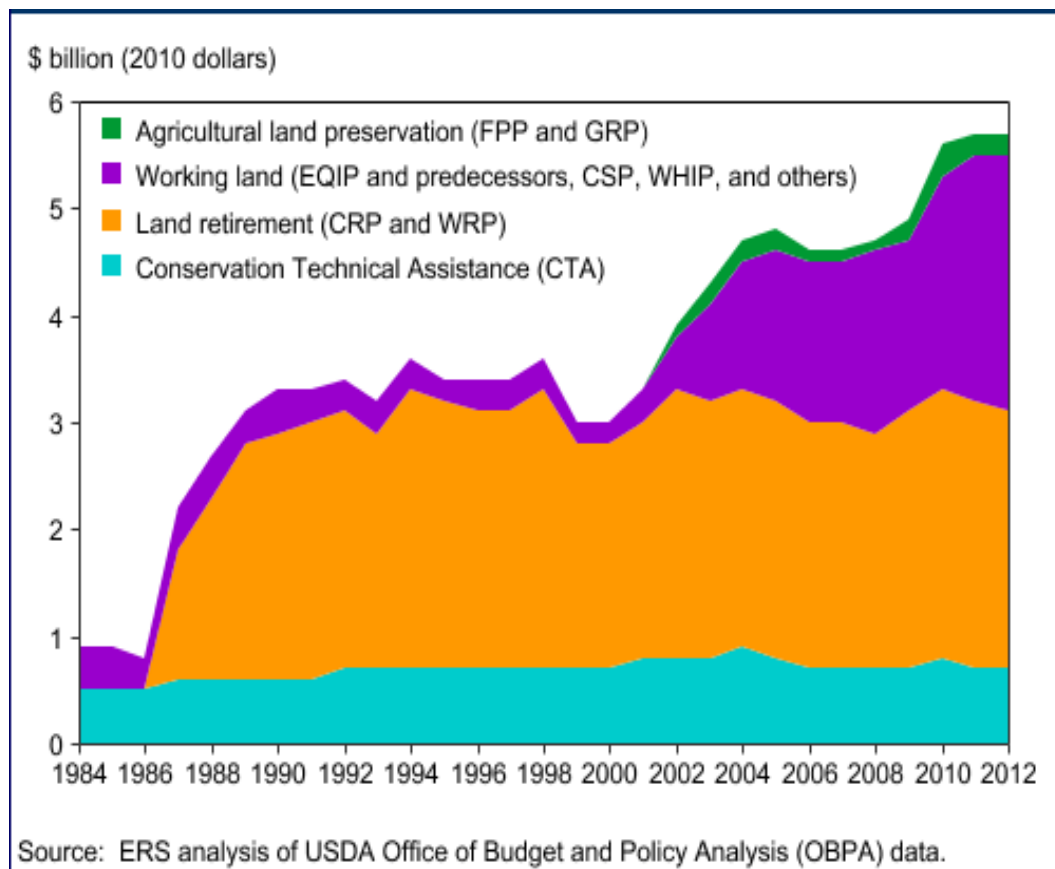
Working Lands

- Conservation Stewardship Program (CSP)
- Environmental Quality Incentive Program (EQIP)
- Wildlife Habitat Incentive Program (WHIP)

Agricultural Land Preservation

- Farm and Ranch Lands Protection Program (FPP)
- Grassland Reserve Program (GRP)

Trends in US Conservation Program Spending, 1984-2012



Land retirement programs (mainly CRP) receive most funding since creation of CRP in 1985

Working lands programs' receive larger share of funding since 2002 farm bill

Context of new Conservation programs

- Agricultural Act of 2014 reduces ten-year spending to Conservation by \$6B, reduces enrollment cap from 32M acres to 24M acres in 2018
- 23 conservation programs “rolled” into 13
- Link to changes in Crop insurance – opportunities

Question 1. What is basis for intervention to affect the economics of conservation?

- Onsite and offsite amenities --
- Part of “payment for ecosystem services” -- designed to address the **under-provision** of environmental amenities
- Govt steps in to secure environmental benefits
- Voluntary approaches vs direct regulations, taxes
- In agriculture, culture is one of “paying farmers for conservation”
- Thanks to farmers, we get many services, free of charge

The Dust Bowl: Impetus for Intervention in US Conservation

- Extensive cultivation, intensive tillage, and severe drought in 1930s combined to create massive dust storms that marked Dust Bowl era
- Great Plains' average annual loss of topsoil: 480 tons/acre (1930-1940)
- Dust Bowl emphasized soil erosion crisis to public, providing impetus for intervention in conservation

The Dust Bowl: Impetus for Intervention in US Conservation



Dust cloud rises over unspecified town in southern Plains

(Kansas Historical Society at kansasmemory.org)

Question 2. What is society buying with conservation programs?

To farmers: Means to receive farm support to provide a public good and invest in their natural capital

To environmentalists: A way to encourage resource stewardship

To NGOs: A way to fight poverty and distributional impacts

To policymakers: A way to address the interests of various groups, create opportunities for American farmers AND tackle the major challenges of feeding the future in a smart sustainable manner

Question 3. What are the major issues to allocating conservation spending?

How should conservation funds be allocated among geographic areas?

- Should funds be concentrated on some selected watersheds or distributed over a broad geographic area?
- Should funding priorities be given to areas with the worst environmental problems or areas that have made some environmental improvements?

Question 3. What are the major issues to allocating conservation spending? (cont.)

Within a given geographic area, what criteria should be used to target resources for conservation?

- Should we target marginal land or land most vulnerable to environmental damage?
- What should payments be based on? Should payments be based on the adoption of certain conservation practices or some measure of environmental benefits?
- If a bidding process is used, what criteria should be used to select bids for acceptance?

Question 3. What are the major issues to allocating conservation spending? (cont.)

What are the distributional implications of alternative conservation strategies?

- If poverty reduction is a primary goal of resource conservation, what strategy is most effective for helping the poor?

Targeting Criteria for CRP Land Retention

1. Cost targeting – to retain CRP lands that require lowest rental payment per acre.
2. Benefit targeting –to retain CRP lands that provide the highest environmental benefit per acre.
3. Benefit-cost targeting –to retain CRP lands that offer the highest benefit-cost ratios.
4. Benefit-maximizing targeting – to retain CRP lands that provide the largest environmental benefit for a given budget.

Question 4. Are the benefits to society worth the costs of conservation? (cont.)

- Evidence shows that CRP's total benefit exceed total taxpayer cost
- Targeting strategies that consider “slippage effects” could improve CRP performance
- Conservation compliance (voluntary): Works! But is uncertain under 2014 farm Bill (Doering and Smith, 2012)

Conservation Effects Assessment Project (CEAP)

- Multi-agency USDA NRCS effort to quantify environmental effects of farmers' conservation practices on nutrient and sediment loadings
- Quantifies effects of all conservation programs (local, regional, and national)
- Chesapeake Bay Watershed is first location with two rounds of study (2003-06 and 2011)

CEAP in the Chesapeake Bay Watershed

- Watershed touches DC and 6 states (VA, WV, MD, DE, NY, and PA); 84,000 farms; and 17M people
- Land area is 10% cropland
- Because of conservation practices adopted on cropland since 2006:
 - ✓ Sediment entering the Bay was reduced by 8%
 - ✓ Nitrogen was reduced by 6%
 - ✓ Phosphorus was reduced by 5%

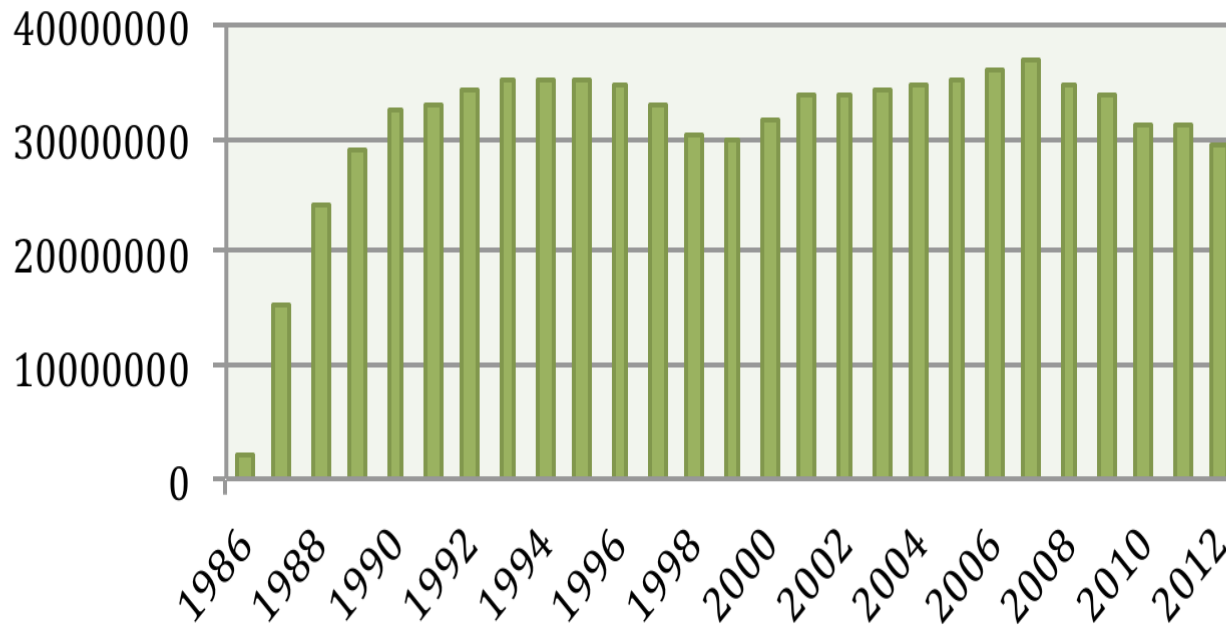
(USDA NRCS 2013)

The CRP: a few details

- A primary goal of the CRP was to reduce soil erosion on highly erodible cropland.
- Secondary objectives included
 - protecting soil productivity,
 - reducing sedimentation,
 - improving water quality,
 - improving fish and wildlife habitat,
 - curbing production of surplus commodities, and
 - providing income support for farmers.

The CRP enrollment

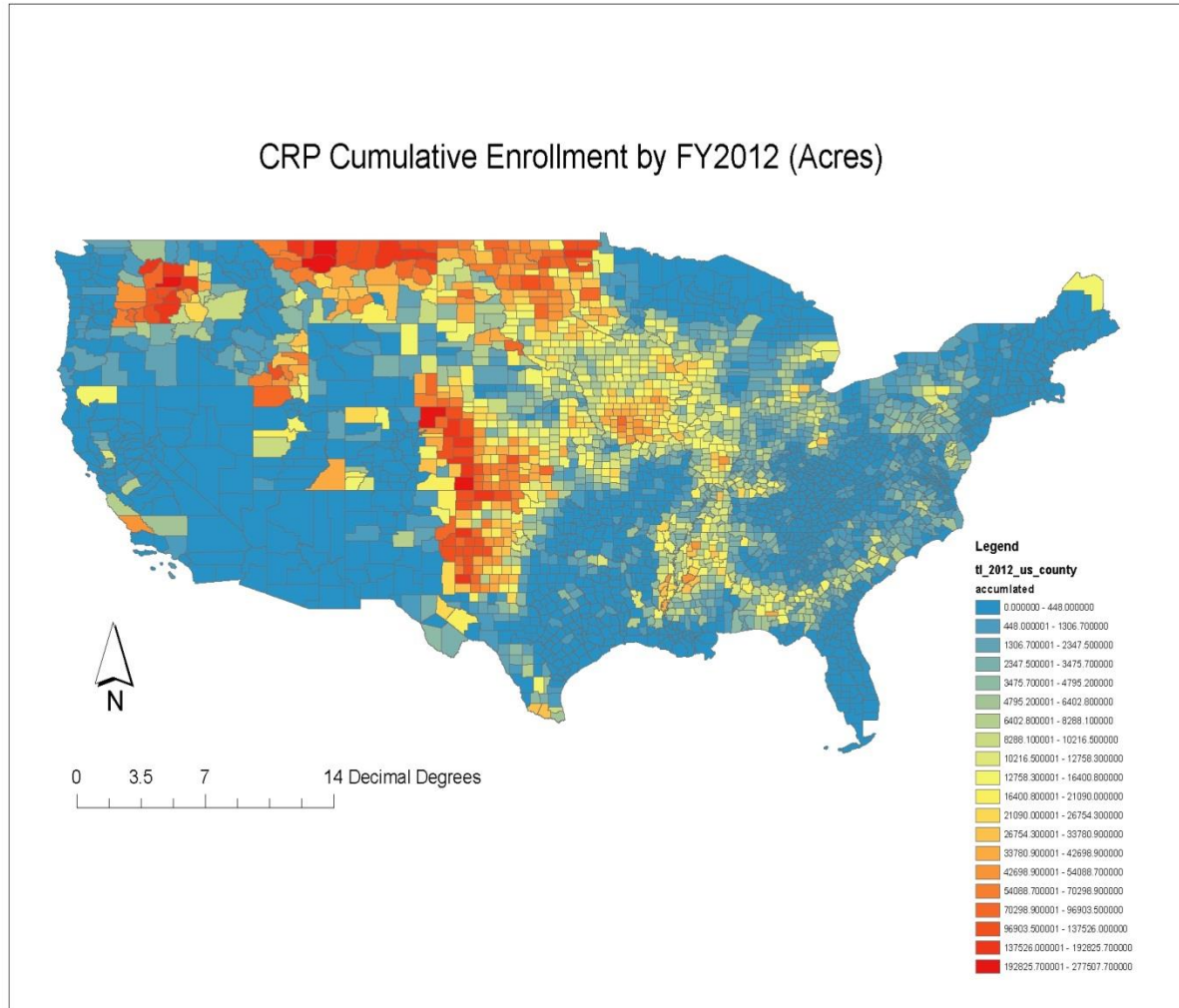
Figure 1. Conservation Reserve Program - Cumulative Enrollment by Year (Acres)



Data source: USDA (2012c). Shown here are acreages at the end of fiscal year (September 30).

The CRP map

CRP Cumulative Enrollment by FY2012 (Acres)



Question 4. Are the benefits to society worth the costs of conservation?

Selected Economic Impacts of Conservation Reserve Program

Impacts	\$/CRP Acre/Year
Reduced soil erosion ^a	20
Recreational benefits ^a	29
Increased agricultural land value ^b	34
Increased developed land value ^b	24
Average CRP Rental Cost in 2011	52

Note: Estimates adjusted for inflation to represent 2011 dollars

^aSullivan et al. (2004)

^bWu and Lin (2010)

CRP Environmental Impacts

- *Reduced soil erosion:* By 224 million tons a year, or approximately 6.8 tons per CRP acre, based on 1997 enrollments (Sullivan et al. 2004).
- *Improved water quality:* Reduced nitrate loadings by 90 percent, sediment and herbicide loadings by 50 percent, and phosphorous loadings by 30 percent in some U.S. agricultural regions.
- *Wildlife habitat:* By converting row cropland into native grasslands and trees, the CRP benefits many wildlife species.

Question 5. What tools are needed to “better” quantify the costs and benefits of conservation? Targeting performance

- Economics and biophysical need to “talk” to each other to account for key features of ecosystems; (thresholds, spatial linkages)
- Focus on targeting performance
- Emerging technologies can help farmers track efforts and data (e.g., smartphones and web-applications)
- Farmers can use data to **identify** improved management practices

Emerging Technologies

Several emerging technologies can facilitate farm-level data collection and interpretation:

- ***AgTools™*** – suite of programs designed to help agricultural producers make better decisions to manage their financial risk, address climate change and other drivers, and track environmental performance (Oregon State University)
- ***Cool Farm Tool™*** – GHG calculator to help farms measure carbon footprint of crops and livestock (Unilever and University of Aberdeen)
- ***AgBalance™*** – a method to measure and assess sustainability in agriculture across all three pillars: economy, environment and equity (BASF)

Data Mining: BIGDATA

- NSF & NIH joint solicitation: Core Techniques and Technologies for Advancing Big Data Science & Engineering (BIGDATA)
- Big data – large data sets generated from instruments, sensors, Internet transactions, email, video, click streams, and/or all other digital sources
- Advance means of managing, analyzing, visualizing, and extracting information from big data
- **Question: How to use technology to design smart policies**

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Thank you!

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UNIVERSITY

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