



# Making Sense of GHG Markets and Other Market-Based Approaches

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# Allowing Offsets Lowers Overall Costs of Abatement Under Lieberman-Warner Cap-and-Trade Legislation



— Lieberman-Warner (15% cap on offsets)
 — Alternative with no cap on offsets
 — No Offsets

# Financing large-scale land-based greenhouse gas mitigation

While cost-effective, aggregate expenditures of large scale mitigation could be daunting:

- 600 million Tons CO<sub>2</sub> @\$15/ton ~ \$9 billion/yr
- 1,400 million tons CO<sub>2</sub> @ @30/ton ~\$42 billion /yr

## Options:

- Regulation
- Incentives: through existing programs or new program
- Agriculture offsets to regulated markets (cap and trade)
- Hybrids

# Concerns with Offsets

Offsets are produced by entities that are not regulated:

- Would the action have happened anyway? (Additionality)
- Will other firms/entities fill gaps if the action results in a drop in production? (Leakage)
- What are we measuring benefits against? (Baselines/benchmarks)

Carbon sequestration is unique:

- Will the carbon that is sequestered and stored be kept out of the atmosphere? (Permanence)

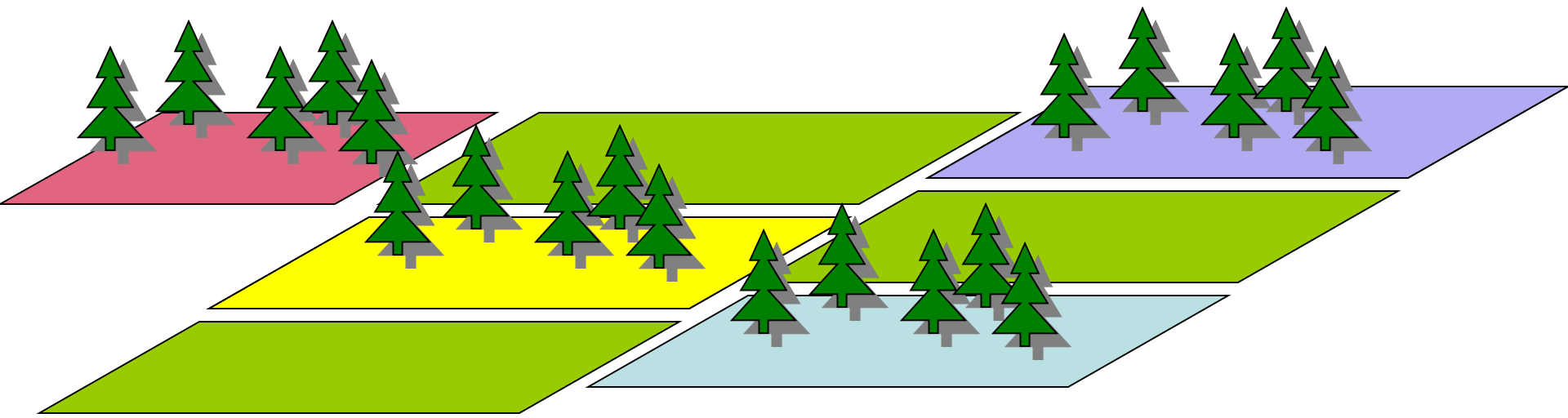
Most agriculture and forestry sources and sinks are not well defined “point” sources:

- Can we truly assess the benefits? (Measurement uncertainties)

# The Problem with Solutions to Offset Problems

Farmer 1  Farmer 2  Farmer 3  Farmer 4 

<b>Carbon Payment</b>	0	\$	\$	\$
<b>Discount to address leakage</b>				-\$
<b>Additionality Discount</b>				-\$
<b>High reporting costs</b>				-\$



# Agricultural Carbon Offset Markets

## Regulatory

California ARB  
RGGI

- U.S. forest conservation
- Urban forest projects
- Rice cultivation
- Manure projects

## Voluntary

American Carbon  
Registry (ACR)  
Climate Action  
Reserve (CAR)  
Verified Carbon  
Standard (VCS)

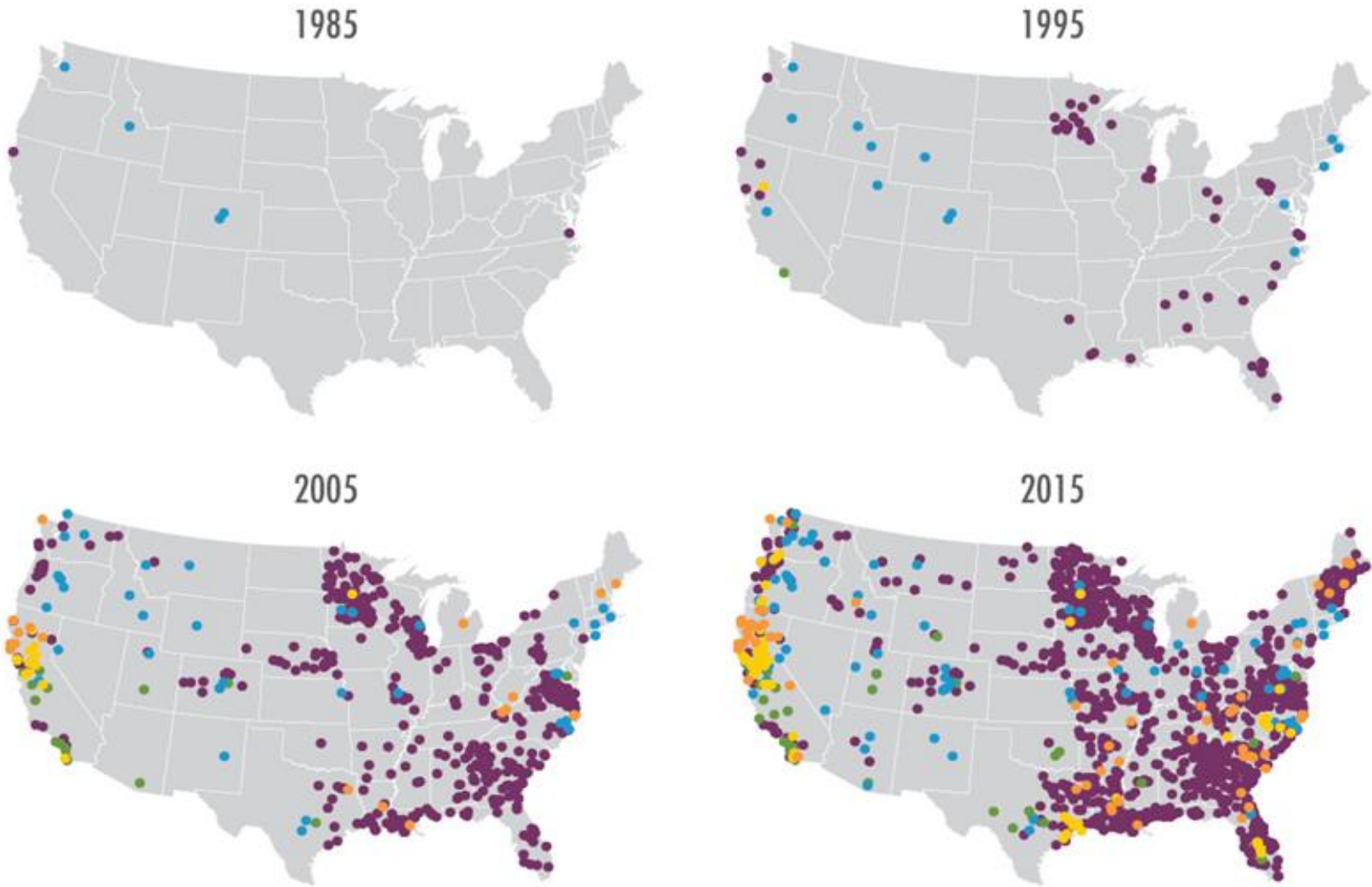
- Fertilizer N<sub>2</sub>O
- Rice
- Avoided grassland conversion
- Grazingland and livestock management
- Grassland compost additions
- Etc.

## Other

- “Over the Counter” transactions

- Chevy Prairie Pothole Project
- Conservation Innovation Grants

# U.S. Environmental Market Growth 1985 - 2015



● Forest carbon ● Imperiled species/habitats ● Wetlands and streams ● Watersheds ● Multiple asset types



# U.S. Environmental Market Activity

Sector	Estimated Volume	Year
Wetlands		
Banks	\$3.50 billion	(2016)
In-Lieu Fees	\$0.04 billion	(2015)
Species and Habitat	\$0.35 billion	(2016)
Carbon and Greenhouse Gas		
Voluntary	\$0.05 billion	(2015)
CA Regulatory	\$0.06 billion	(2015)
Water Quality		
Trading	\$0.03 billion	(2015)
PWS	\$0.07 billion	(2015)
Water Quantity		
In-stream buybacks	\$0.05 billion	(2015)



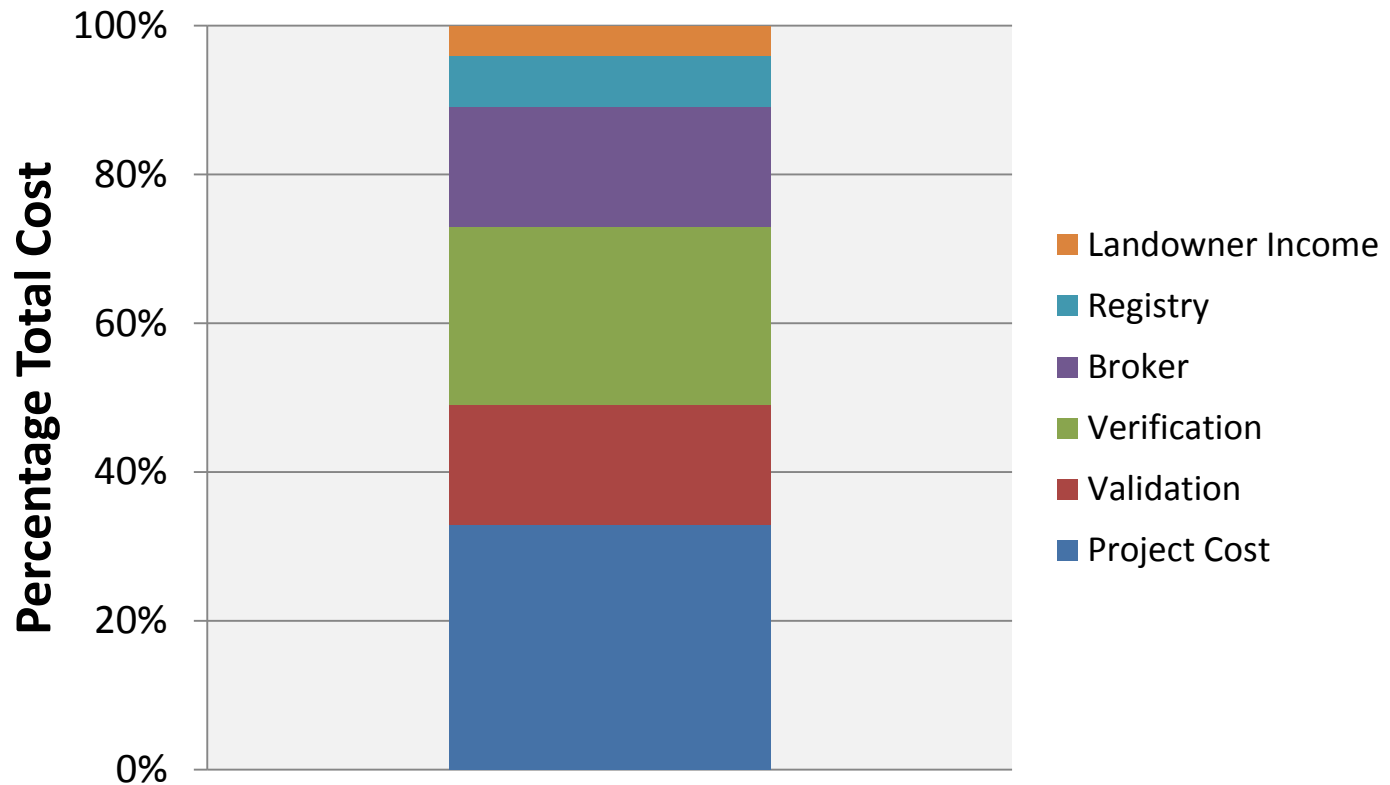
# Transaction costs in carbon markets

Type of transaction cost	Activity Involved
Protocol development	Establishing baseline, additionality, quantification, etc.
Information and search	Identifying sellers and buyers
Negotiation	Lawyers/contracts/easements
Project design and approval	Creating a project plan and assembling associated documents
Monitoring	Data collection and record keeping
Verification (3 <sup>rd</sup> party)	Desk review or site visit to ensure accurate reporting of benefits



# What does it take to get an offset to market?

## Hypothetical Carbon Project



# Alternatives - Public

## Traditional conservation programs

- Incorporating market principles

## Revenue Recycling

- California
- “Carbon Bank”

## Harnessing the carbon cycle

- Biobased liquid fuels
- Biomass heat and power
- Biochar
- Bio-based products



# Alternatives – Private

## Partnerships and Corporate Initiatives

### In-setting

- Corporate driven reductions

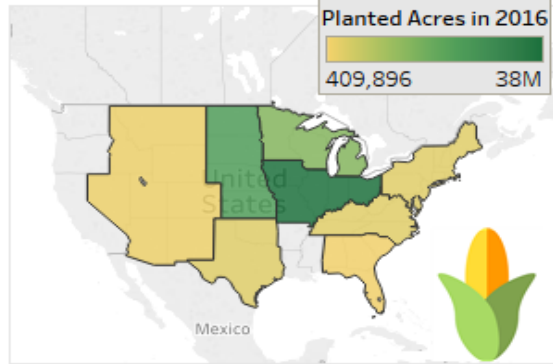
### Sustainability Supply Chains

- Field to Market
- Kellogg's
- General Mills

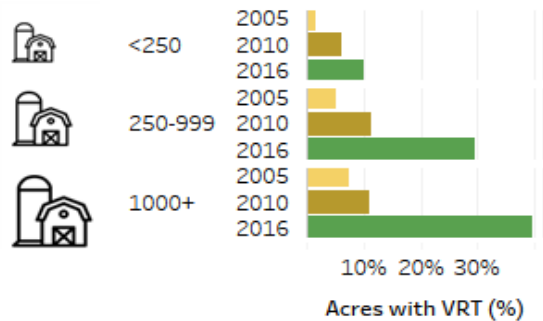


# Variable Application Rate Technology for Fertilizers: Corn

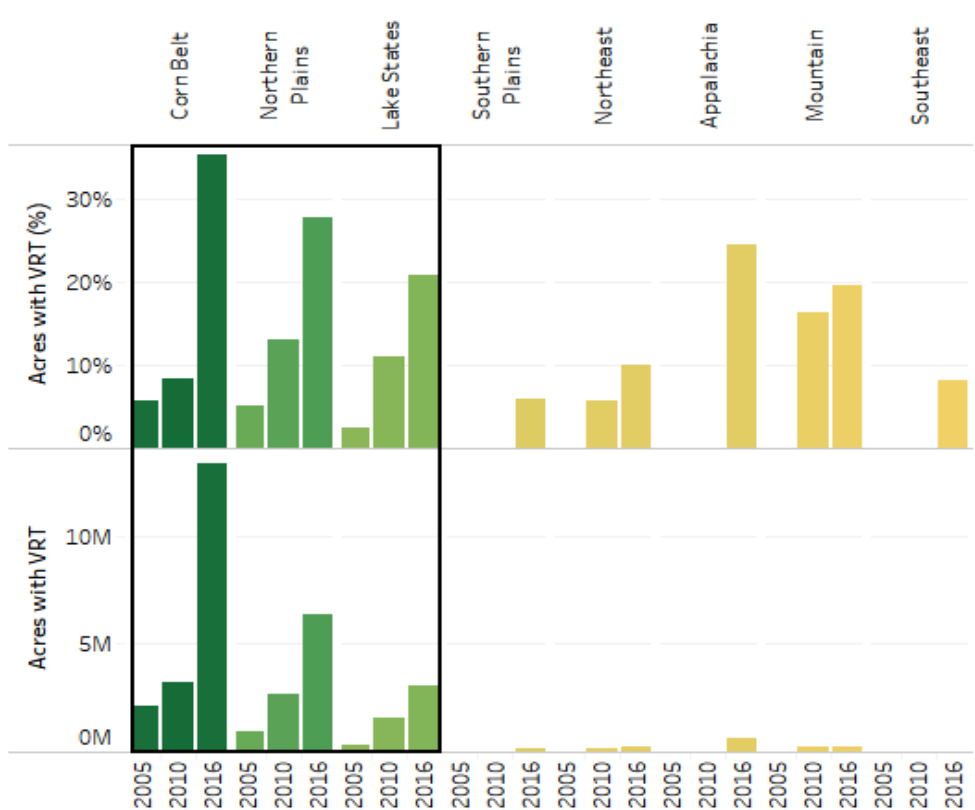
a) Planted Acres of Corn



c) Percent of Acres with VRT by Farm Size

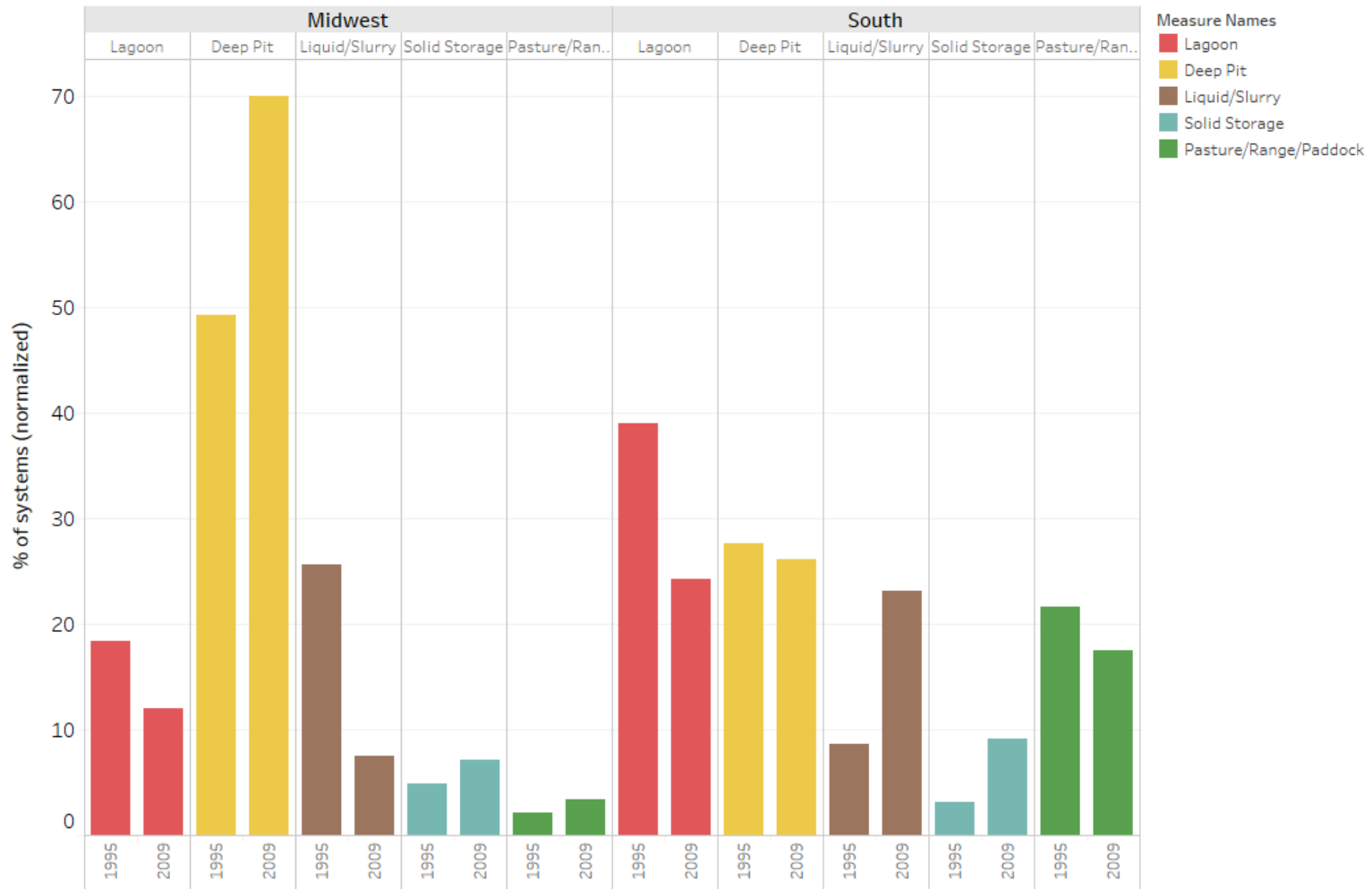


b) Percent of Acres with VRT by USDA Region



Source: Data from ARMS, courtesy of USDA ERS

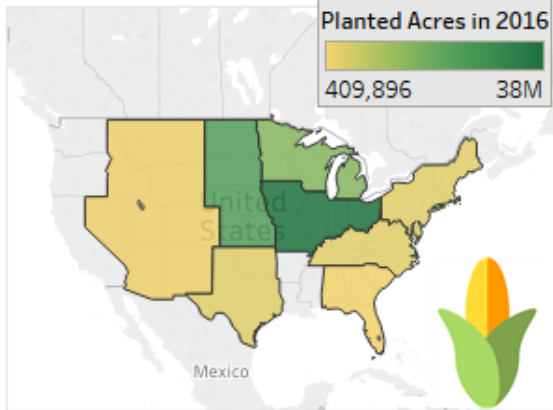
# Manure Management: Swine



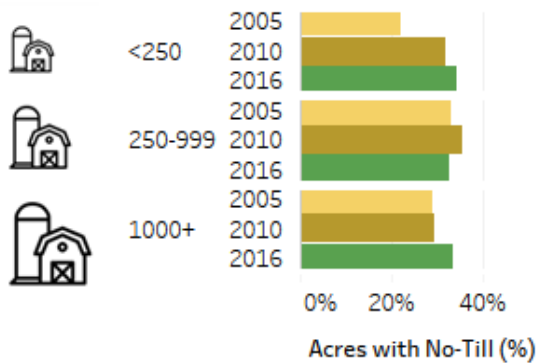
*Preliminary analysis by Eastern Research Group based on ARMS and NAHMS data*

# No-Till: Corn

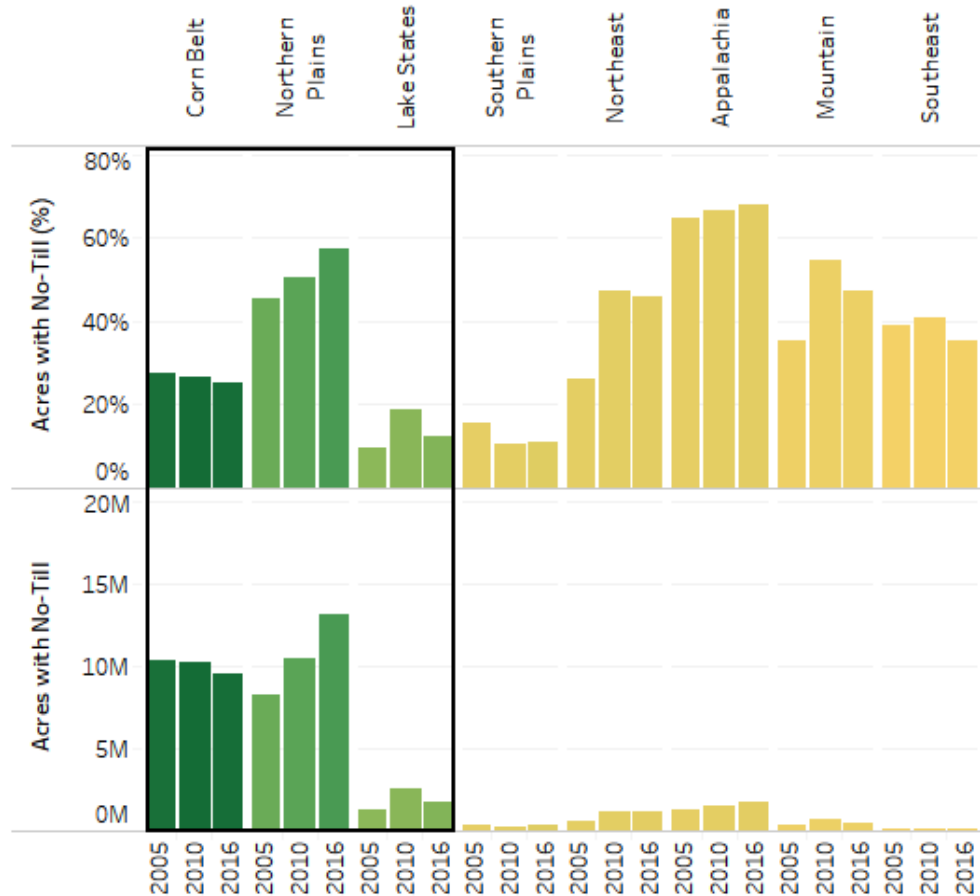
a) Planted Acres of Corn



c) Percent of Acres with No-Till by Farm Size



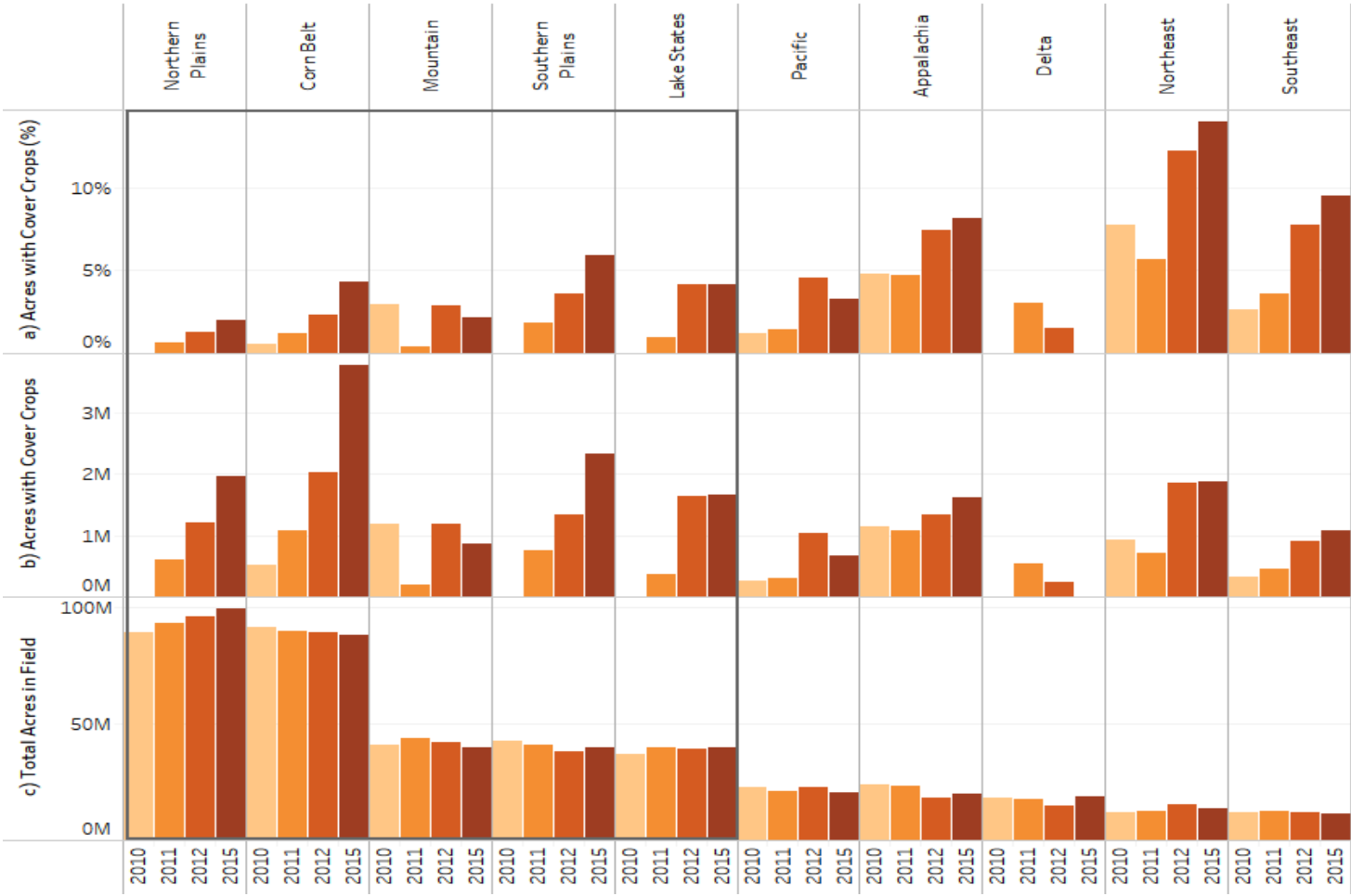
b) Percent of Acres with No-Till by USDA Region



Source: Data from ARMS, courtesy of USDA ERS

# Cover Crops—all crops

Acres with Cover Crops (Farmland for Crops and Livestock) by USDA Region



Source: Data from ARMS, courtesy of USDA ERS



# Concluding Remarks

## Glass half-empty

- Accepting offsets as an “open system” has not happened
- Concerns about transaction costs have materialized but are hidden due to overall low adoption rates
- Voluntary demand for “offset credits” through registries weak

## Glass half-full

- Quantification methods exist
  - The Blue Book
  - COMET-Farm and COMET-Planner
- Interesting trends in conservation adoption rates within agriculture
- Private Sector under pressure to demonstrate “sustainability”
- Offset lessons can be applied to a variety of policy approaches