

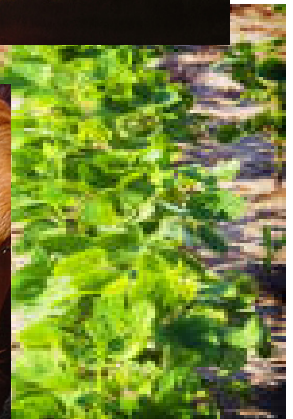
# *Carbon Cap-and-Trade: What's in it for Agriculture?*

## *Rewarding Agriculture for GHG Mitigation*

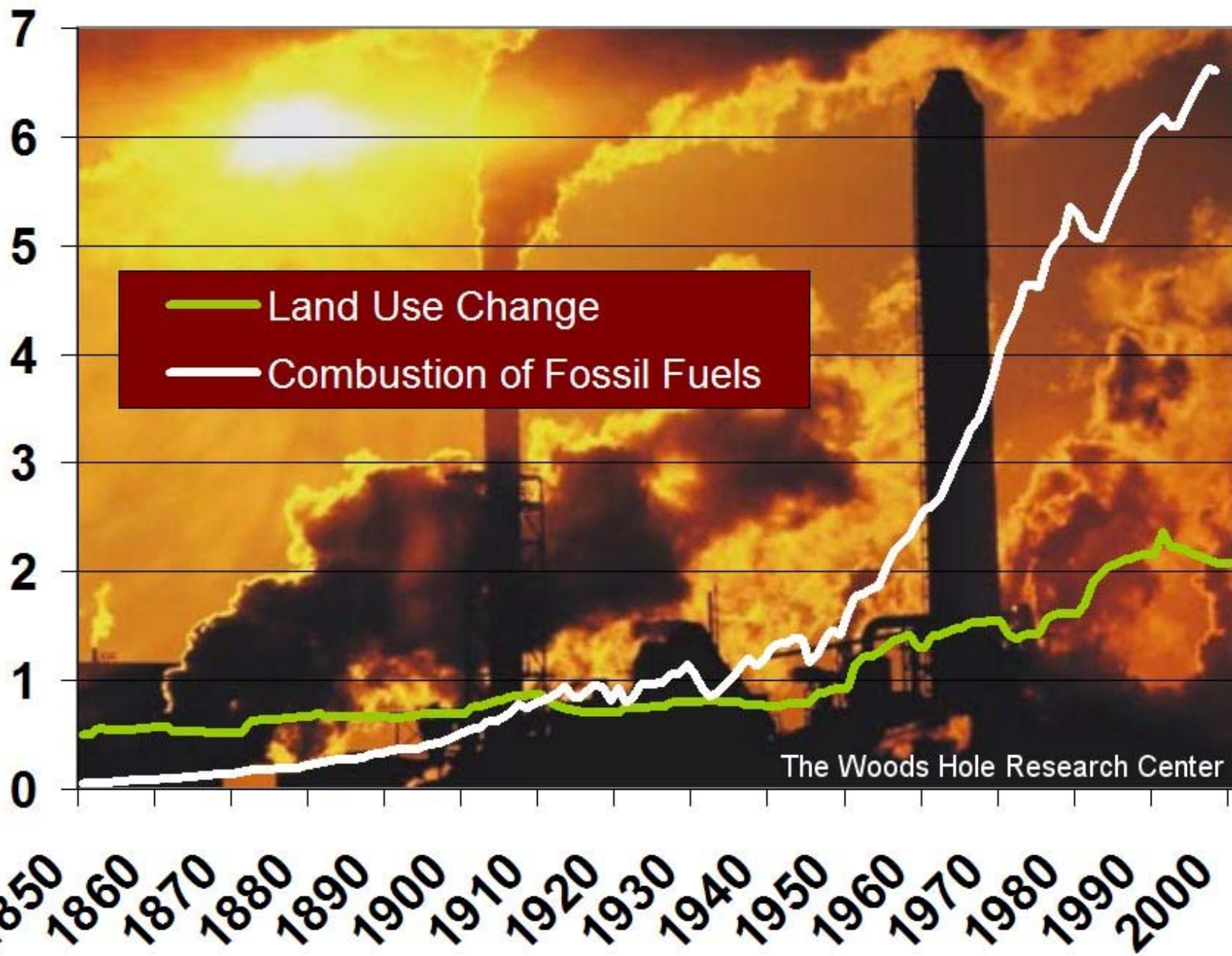
Agricultural Air Quality Task Force  
Salt Lake City, Utah  
May 14, 2008

**Debbie Reed**  
**DRD Associates**

**drd**  
associates



# Annual Emissions to the Atmosphere (PgC)



The Woods Hole Research Center

# Global Climate Change ...and GHG Emissions, Reductions

If atmospheric CO<sub>2</sub> levels are to be stabilized at reasonable concentrations **by 2050** (450-650 ppm CO<sub>2</sub>), drastic reductions in emissions are required over the next 20-30 years.

*--IPCC Special Report on Emissions Scenarios*

During this critical 20-30 year period, **all available emissions reductions measures must be utilized**, and new energy technologies must be developed.

# Global Climate Change ...and Agriculture

- Agriculture is both a **source of GHG**, and a **sink (GHG reservoir)**
- As a source of GHG, agriculture contributes approximately **8% of US GHG emissions** – mostly from small, diffuse, non-point sources
- $N_2O$  and  $CH_4$  account for the largest share of agricultural emissions ( $CO_2$  equivalent basis)

# Global Climate Change ...and Agriculture

*The Role of U.S. Agriculture in Climate Change Mitigation:*

- **Reducing emissions** from agricultural sources of GHG, or displacing fossil fuels,  
or
- **enhancing sinks** (forest and soil carbon sequestration)



# Global Climate Change... and Agriculture

## *Agricultural Sources of Nitrous Oxide (N<sub>2</sub>O) emissions:*

- Soils
- Fertilizers
- Land application of manure



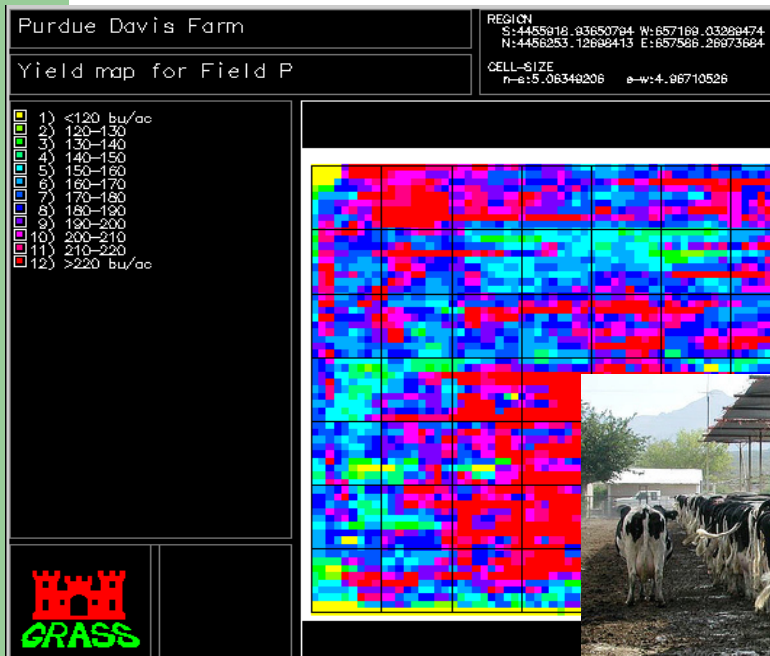
# Global Climate Change... and Agriculture

## *Agricultural Sources of Methane (CH<sub>4</sub>):*

- Livestock (enteric fermentation, manure)
- Soils
- Rice cultivation



# Global Climate Change... and Agriculture: Mitigation Options for Agriculture



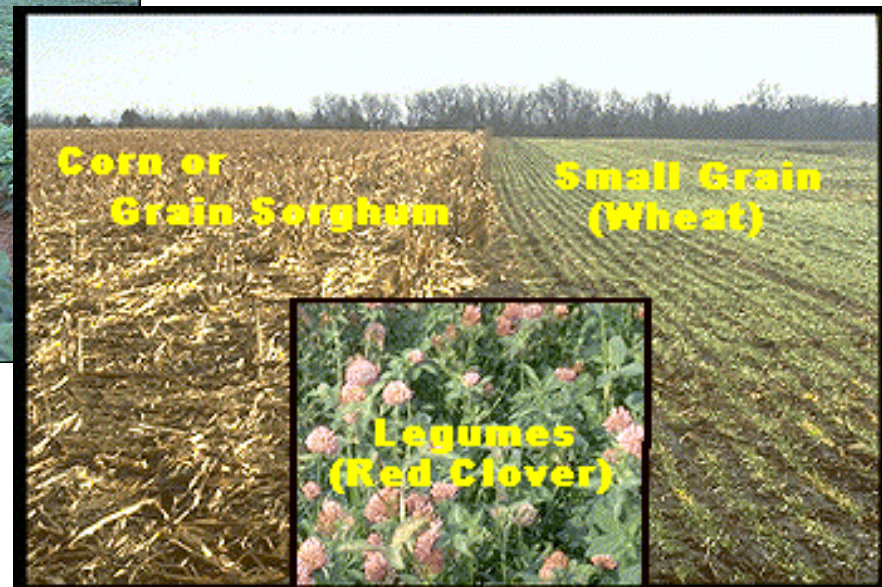
$\text{CH}_4$   
 $\text{N}_2\text{O}$



# Global Climate Change... and Agriculture

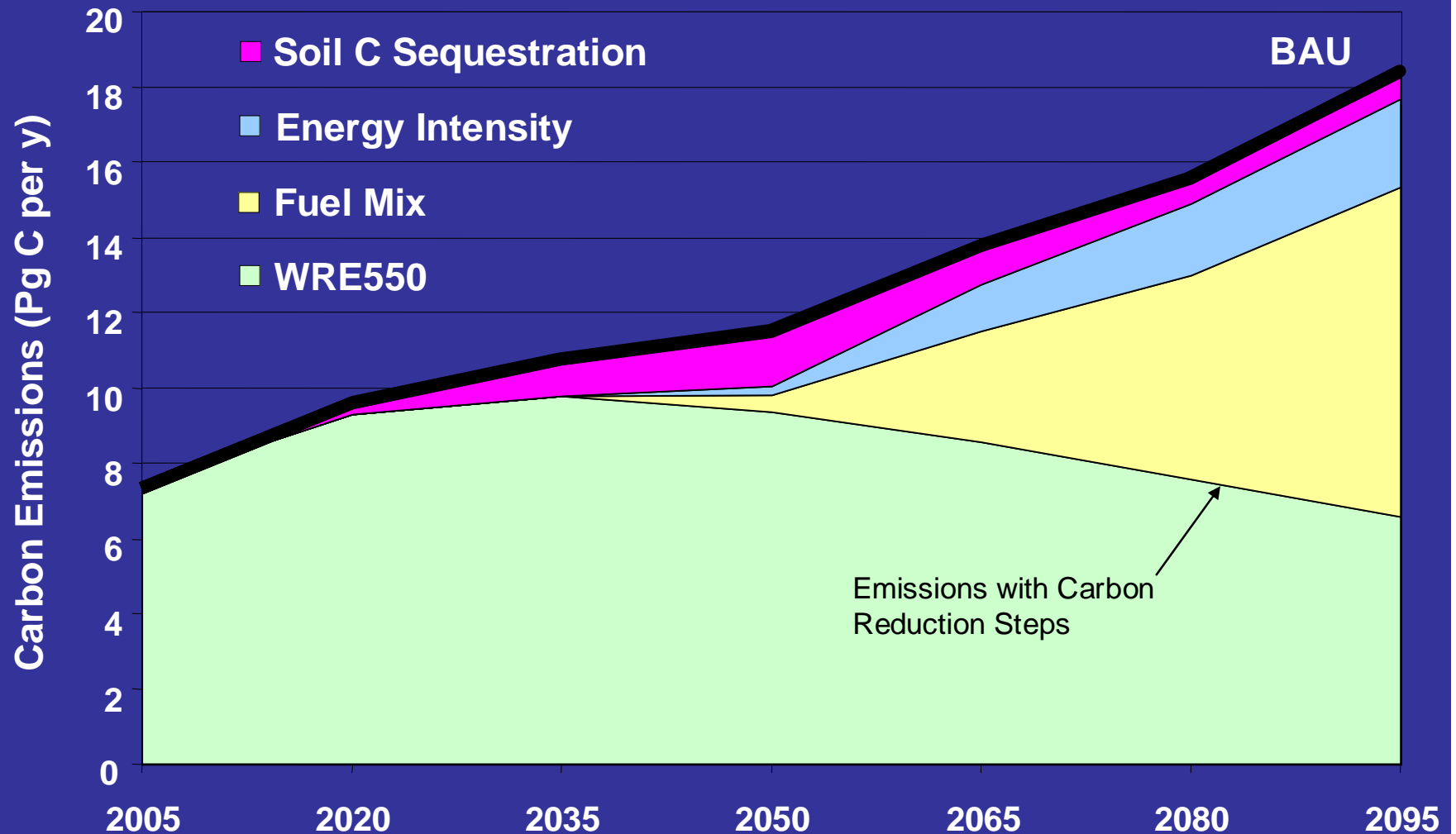
## Mitigation Options for Agriculture

**\*\* Enhancing the soil carbon sink \*\***



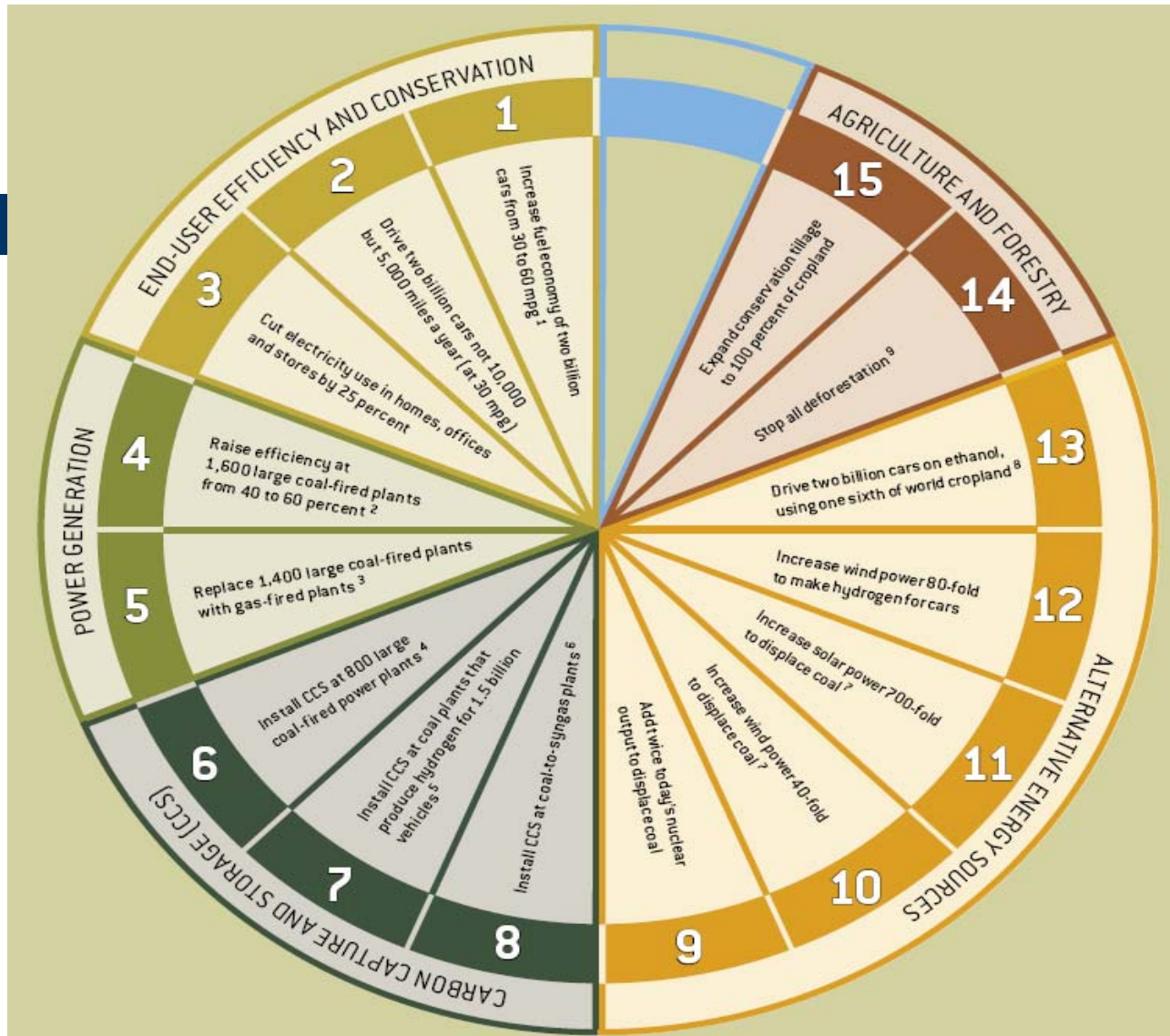
- ***No-till***
- ***Cover Crops***
- ***Crop Rotations***

## Carbon Emissions Reductions: WRE 550 with Soil Carbon Sequestration Credits



From: Rosenberg, N.J., R.C. Izaurralde, and E.L. Malone (eds.). 1999. Carbon Sequestration in Soils: Science, Monitoring and Beyond. Battelle Press, Columbus, OH. 201 pp.

# Emission Reduction “Wedges”



Source; Socolow and Pacala, *Scientific American*, September 2006, p.54

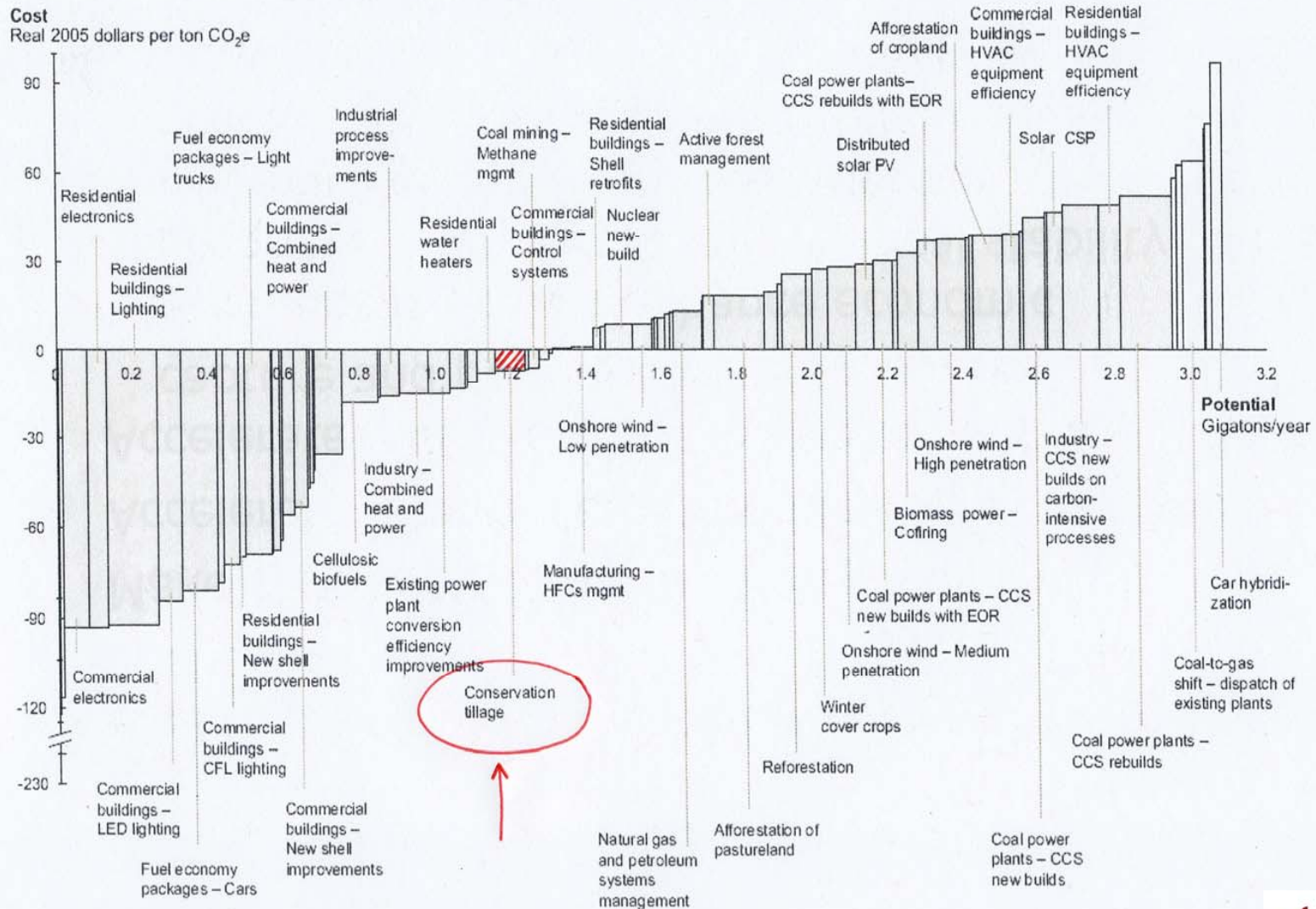
# Potential CO<sub>2</sub> Reduction Options

|  | <b>Rapidly Deployable</b>  | Not Rapidly Deployable  |
|--|--|---|
| <b>Minor Contributor<br/>&lt;0.2 PgC/y</b> | <ul style="list-style-type: none"> <li>• <b>Biomass co-fire electric generation</b></li> <li>• Cogeneration and Hydropower</li> <li>• Natural Gas Combined cycle</li> <li>• Niche options</li> </ul>   | <ul style="list-style-type: none"> <li>• Photovoltaics</li> <li>• Ocean fertilization</li> </ul>  |
| <b>Major Contributor<br/>&gt;0.2 PgC/y</b> | <ul style="list-style-type: none"> <li>• <b>C sequestration in Agricultural soils</b></li> <li>• Improved efficiency</li> <li>• Industrial Non-CO<sub>2</sub> gas abatement</li> <li>• <b>Ag non-CO<sub>2</sub> gas abatement (CH<sub>4</sub>, N<sub>2</sub>O)</b></li> <li>• Reforestation</li> </ul> | <ul style="list-style-type: none"> <li>• <b>Biomass to hydrogen</b></li> <li>• <b>Biomass to fuel</b></li> <li>• Cessation of deforestation</li> <li>• Energy-efficient transport</li> <li>• Geologic storage</li> <li>• High efficiency coal technology</li> <li>• Large-scale solar</li> <li>• Next generation nuclear fission</li> </ul> |

Caldeira et al. 2004. A portfolio of carbon management options, p. 103-130,  
 In C. B. Field and M. R. Raupach, eds. The Global Carbon Cycle. Island Press, Washington, DC.



# McKinsey Study Shows U.S. Can Get Large GHG Cuts at Low Costs



Source: McKinsey, "Reducing U.S. Greenhouse Gas Emissions," November, 2007

# Global Climate Change ...and U.S. Agriculture



Q: What are the *potential contributions* of soil carbon sequestration to climate change mitigation in the U.S.?

- Technical
- Economic

# Global Climate Change... and Agriculture

## *Technical potential:*

- Agricultural soil sinks have the potential to offset 10-15% of annual CO<sub>2</sub> emissions\*
- N<sub>2</sub>O and CH<sub>4</sub> offer additional potential reductions

## *\*Economic potential:*

- Depends on policies, and CO<sub>2</sub> price



# ***Carbon Cap-and-Trade: What's in it for U.S. Agriculture?***

## ***Premise:***

WE do not have the luxury of excluding *agricultural emissions reductions* from GHG cap-and-trade policies;

***AND***

AGRICULTURE should receive *full market value* for emissions reductions (i.e., considerable income generation opportunities exist).



## ***Carbon Cap-and-Trade: What's in it for U.S. Agriculture?***

Q: Why are Agricultural Sinks Important for Cap-and-Trade?

A: Offsets are a *cost-containment measure*, and, soil sinks have multiple ancillary benefits to society, and to agriculture:  
**“charismatic carbon credits”**

# Cap-and Trade: Addressing Global Climate Change

Economy-Wide, Cap-and-Trade  
CAP = amount of GHG that can be emitted in a year

- Established by policy
- Reduced every year (theoretically)
- Applies to emitters ID'd by policy

# Cap-and-Trade: Addressing Global Climate Change

## Economy-Wide Cap-and-Trade

Allowance = legal tender, represents  
1 ton GHG *emissions*

- Given/auctioned to capped entities
- Can be traded, sold on GHG market

# Cap-and-Trade: Addressing Global Climate Change

Economy-Wide, Cap-and-Trade  
Offset = legal tender, represents  
1 ton GHG *reductions*

- Given to non-capped entities for proven, verified GHG reductions
- Can be traded, sold on GHG market
- Are a COST-CONTAINMENT measure



# *Carbon Cap-and-Trade: What's in it for U.S. Agriculture?*

## Proposals for Agricultural Sinks in Cap-and-Trade Programs

## ***Practice: Proposals for Agricultural Sinks in Cap-and-Trade Programs***

### S.2191 – The Lieberman-Warner Climate Security Act of 2008

- Caps emissions from petroleum, natural gas, other GHG, and coal facilities
- Reduces total US GHG emissions, via a declining cap on emissions, to 11% below 1990 levels by 2030, and 25% below 1990 levels by 2050

## ***Practice: Proposals for Agricultural Sinks in Cap-and-Trade Programs***

S.2191 – The Lieberman-Warner Climate Security Act of 2008

- ***Offsets:*** entities can meet up to 15% of annual obligations with offset credits
  - Ag and forestry sinks qualify as offsets
- ***Allowances:*** 5% of annual allowance pool given to USDA Secretary to award for emissions reductions for ag, forestry

## ***Practice: Proposals for Agricultural Sinks in Cap-and-Trade Programs***

### S.2191 – The Lieberman-Warner Climate Security Act of 2008

- ***Offsets:*** EPA administrator is directed to develop methods to account for and discount for additionality, baseline, leakage, and uncertainty (of measurement)
- ***Offsets:*** credits only awarded after emissions reductions/sequestration occurs, and are measured, monitored, verified, and entire project verified and approved by EPA and USDA



## ***Practice: Proposals for Agricultural Sinks in Cap-and-Trade Programs***

S.2191 – The Lieberman-Warner Climate Security Act of 2008

- ***Offsets:*** permanence of sinks is addressed by requiring annual certification that sink is ‘intact’, and 100% compensation for any reversal of sequestration

## ***Practice: Proposals for Agricultural Sinks in Cap-and-Trade Programs***

EPA Modeling of S.2191 – The Lieberman-Warner Climate Security Act of 2008, shows:

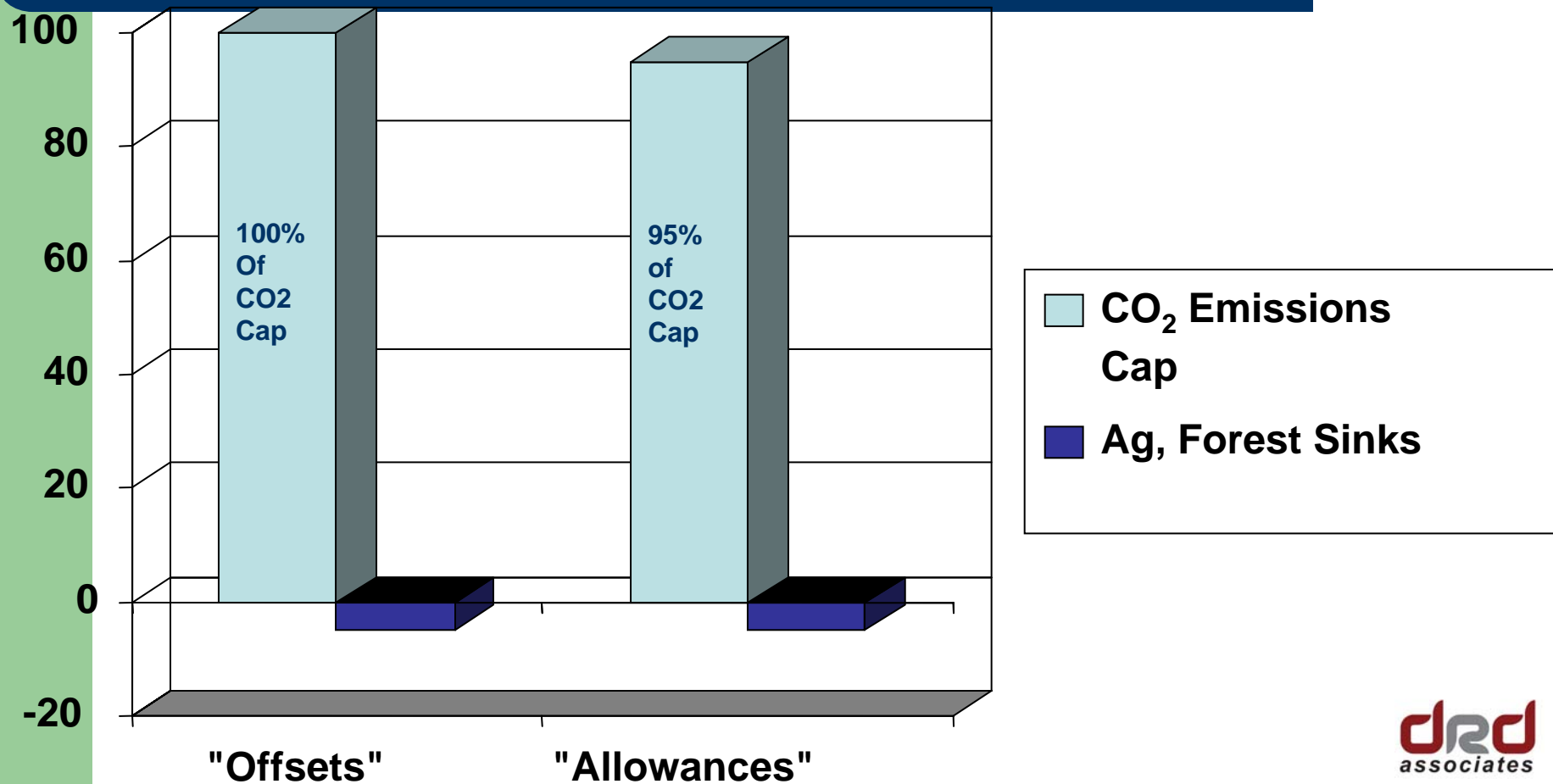
- ***Offsets*** reduce the price of allowances 93% (i.e., allowance prices increase 93% w/o offsets)
- If ***domestic offsets*** are unlimited, allowance prices fall by 26%
- If ***offsets*** are unlimited, allowance prices fall by 71%
- ***Unlimited offsets will not hamper technological innovation because cap is low, and declining***

# Practice: Proposals for Agricultural Sinks in Cap-and-Trade Programs



*In theory*, in a cap-and-trade system, agricultural emissions reductions that are proven and verified will receive **offsets credits** that can be traded or sold in Carbon Markets.....*right?*

# Offsets v. Allowances for Agricultural GHG Credits



# Offsets v. Allowances Schemes for Agricultural GHG Credits

Soil C Credits awarded as *Offsets*:

- Form of free market participation for ag
- Agriculture receives market value for each ton carbon sequestered
- Income opportunity for ag only limited by cap or limit on offsets



# Offsets v. Allowances Schemes for Agricultural GHG Credits

Soil Carbon Credits awarded as *Allowances*:

- Not a free market opportunity; a USDA program
- Value and payment for soil tons/credits determined by USDA
- This scheme is not being considered for any other sector's emissions reductions

## ***Overview of Congressional Activity, And Opportunities for Agriculture***

NRDC/WRI Analysis of Lieberman/Warner, regarding  
***function of allowances for ag sinks:***

“If biological sequestration and emissions reductions from programs supported by USDA are less expensive than the market price of allowances, the USDA could be expected to require more than one ton of emissions benefits for every allowance allocated.”

-- NRDC/WRI 12-4-07

# Offsets v. Allowances Schemes for Agricultural GHG Credits

## *Assumptions:*

- Cost per ton of soil C sequestration: \$25
- Market price per ton of C allowances: \$100
- Not including discounts for leakage, uncertainty, etc.

| Offsets Scheme                 | Allowances Scheme             |
|--------------------------------|-------------------------------|
| Ag payment for 1 ton C = \$100 | Ag payment for 1 ton C = \$25 |
| <b>\$75 PROFIT*</b>            | <b>NO PROFIT</b>              |

## *Practice: Proposals for Agricultural Sinks in Cap-and-Trade Programs*

**ISSUE:** If agricultural sinks are rewarded under the allowances provision, *instead of as offsets*, they:

- Have **no cost-savings value** to society or to capped sectors;
- Provide **no flexibility** to capped sectors or emitters to achieve emissions reductions obligations;
- Provide **no market liquidity**;
- Are **not a cost-containment** measure.

## **Cap-and-Trade: What Role for Agriculture?**

**ISSUE:** Optimally, both an allowances scheme and an offsets scheme should be included, and allowances can *then* be used as a **bonus provision**:

- To reward early actors, who may not qualify for credits due to additionality requirements;
- To reward emissions reductions associated with conservation programs that would not otherwise receive credit.

**BUT:**

**\*\* Allowances are NOT a substitute for offsets. \*\***

## ***Theory: Why are Agricultural Sinks Important for Cap-and-Trade?***

### Economy-Wide Cap-&-Trade:

#### *A New Economy*

- CBO estimates allowances from cap-and-trade worth \$50 B - \$300 B/year
- Over 20 years = \$300 B - \$6 Trillion



# Global Climate Change... and U.S. Agriculture

Q: How do **agricultural sinks** compare to other available GHG emissions reductions **offsets**? (i.e., what's the competition)?

A: They are:

- *Real, proven*
- *readily available*
- *Implement now*
- *low-cost*



- ***NO ONE ELSE can make these claims!***

# Global Climate Change... and Agriculture

Technical potential for soil C sequestration **offsets** is  
168 million tons CO<sub>2</sub> annually\*

- At \$10/ton = \$1.7 billion/year
- At \$20/ton = \$3.4 billion/year
- At \$40/ton = \$6.8 billion/year

The 5% **allowances** provision in Lieberman-Warner is  
estimated to be worth \$4.115 Billion (2012).\*\*

\*USEPA (2005)

\*\*Nicholas Institute, Duke University (2008)

## U.S Cap-and-Trade: What Role for Agriculture?.

- (1) Agricultural emissions reductions are a low-cost, high-impact, readily available means of *near-term* GHG reductions
- (2) However, it is not clear that they will be included in future policies to reduce GHG emissions – not for *credit*, anyway, and not always for *full credit or payment*
- (3) If not included, *from the start*, it is a huge missed opportunity: society and agriculture