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Agricultural Solutions for Carbon Markets: The U.S. Experience

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Sustainable Agricultural Solutions for the Carbon Market: The U.S. Experience

- ▶ GHG Emissions Reductions Policies: Impacts to Agriculture
- ▶ Examples of Agricultural Offset Protocols in U.S. Carbon Markets
- ▶ Key Initiatives in the U.S.
- ▶ Responses to a Constrained Carbon/GHG Future
- ▶ Agriculture's Potential Role in Sustainability and Current and Future Carbon Markets



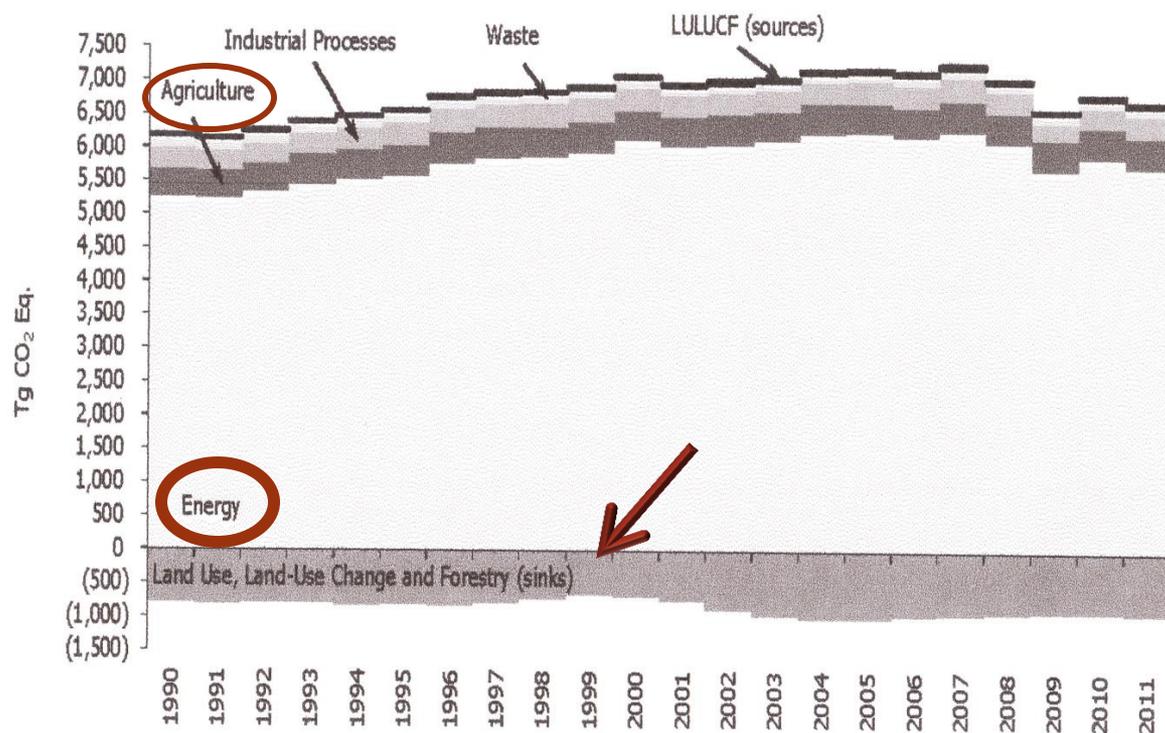
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▶ U.S. Agriculture is both a source and a sink of GHG

Figure 2-4: U.S. Greenhouse Gas Emissions and Sinks by Chapter/IPCC Sector



- US Agriculture is responsible for 6.9% of total U.S. 2011 GHG emissions (USEPA, 2013)

- In aggregate, the U.S. agricultural sector (including GHG sources from crop and livestock production, grasslands, energy use and GHG sinks for forests and urban trees) was estimated to be a **net sink** of 424 Tg CO₂e in 2008. (USDA, 2011)

- Figure: USEPA, 2013

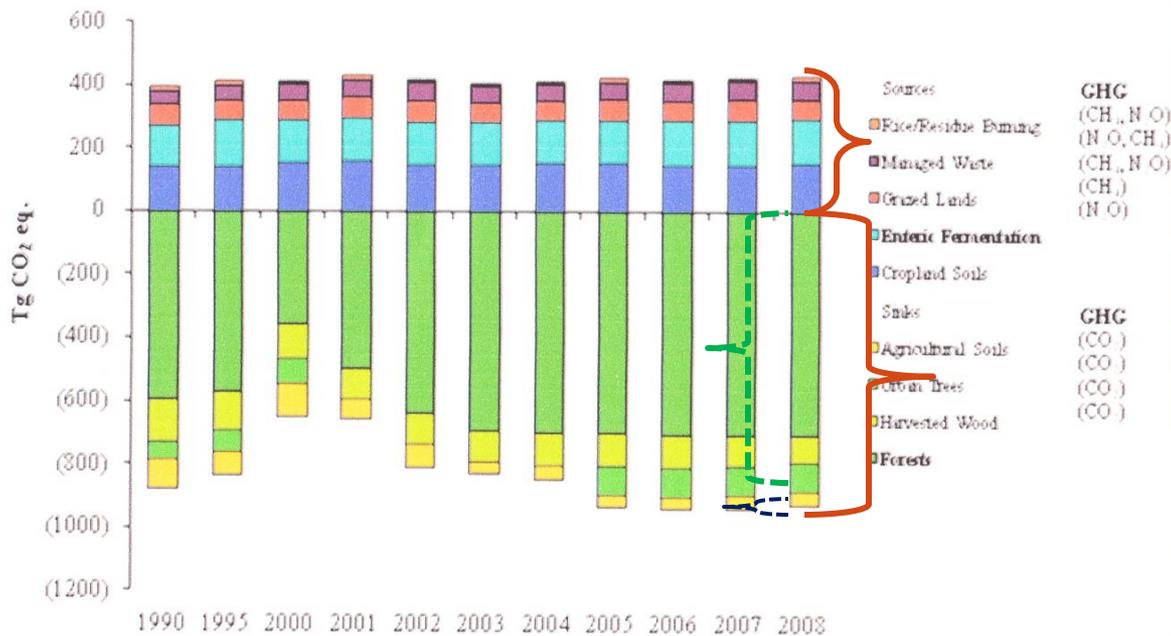
▶ U.S. Agriculture is both a source and a sink of GHG: 1990-2008

Ag & Forestry Emissions and Sinks

• Agricultural Offsets:

- reduce Ag GHG (rice/residue burning, managed waste, grazed lands, enteric fermentation, cropland soils) OR,
- increase Ag sinks (forests, harvested wood, urban trees, agricultural soils)

Figure 1-3
Agriculture and Forestry Emissions and Offsets for 1990, 1995, 2000-2008



Note: Parenthesis indicate a net sequestration. Data not reported for CO₂ sequestration by urban trees from 2001-2004.

Tg CO₂ eq. is teragrams carbon dioxide equivalent. CH₄ is methane. N₂O is nitrous oxide. GHG is greenhouse gases.

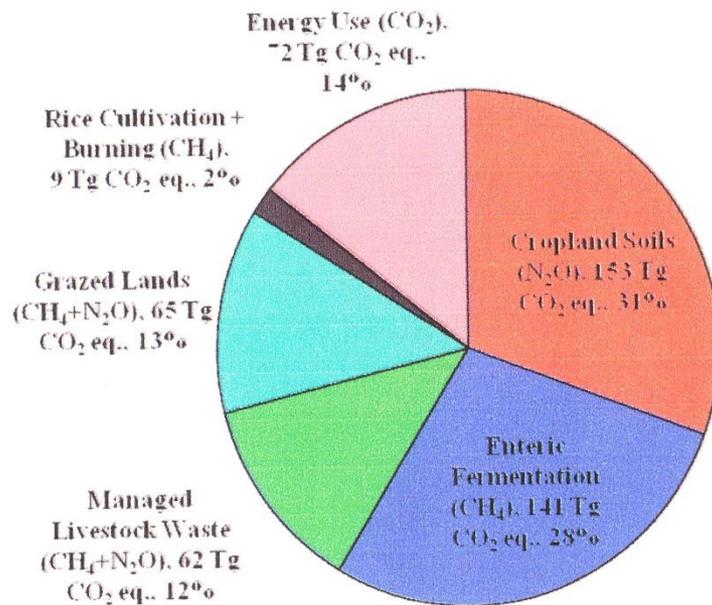
• Figure: U.S. Agriculture and Forestry Greenhouse Gas Inventory: 1990-2008. ClimateChange Program Office, Office of the Chief Economist, U.S. Department of Agriculture. Technical Bulletin No. 1930. 159 pp. June, 2011.

▶ U.S. Agriculture is both a source and a sink of GHG: 2008

Ag Emissions Sources

- Livestock, grasslands, crop production, and energy use contributed a total of 462 Tg CO₂e to the atmosphere in 2008. This total includes an offset from **agricultural soil carbon sequestration** of roughly 40 Tg CO₂e

Figure 1-1
Agricultural Sources of Greenhouse Gas Emission in 2008

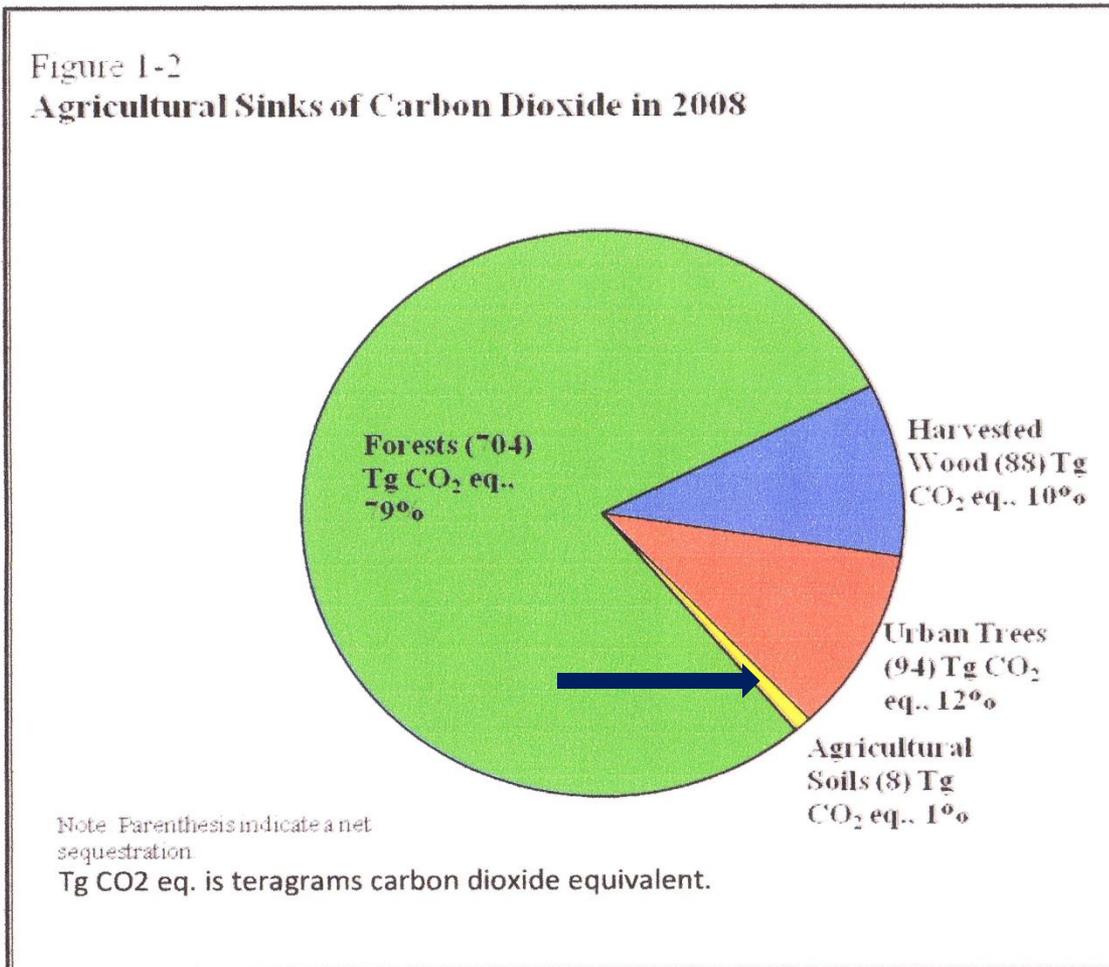


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- *Figure:* U.S. Agriculture and Forestry Greenhouse Gas Inventory: 1990-2008. ClimateChange Program Office, Office of the Chief Economist, U.S. Department of Agriculture. Technical Bulletin No. 1930. 159 pp. June, 2011..

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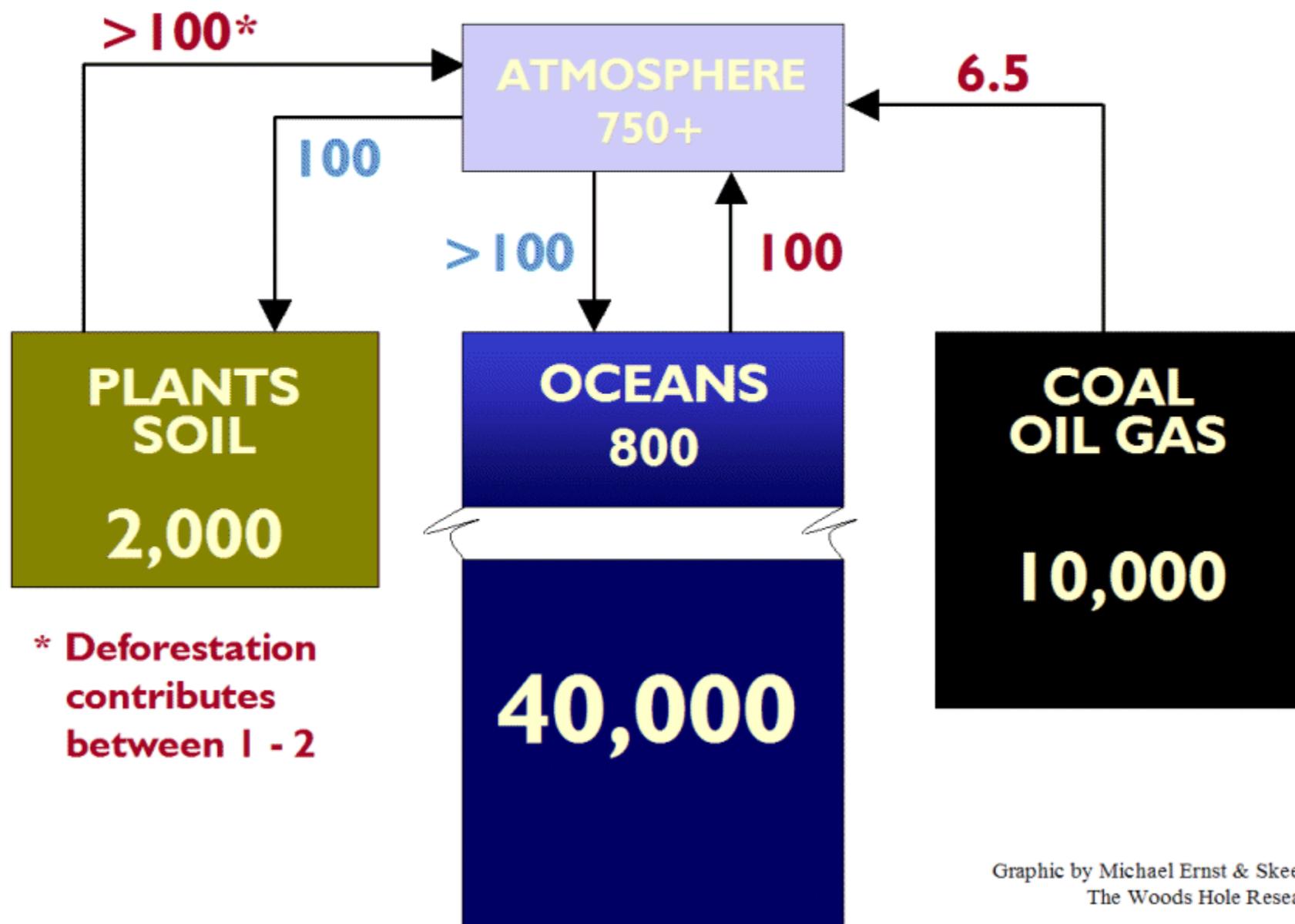
Agricultural Sinks



•Figure: U.S. Agriculture and Forestry
Greenhouse Gas Inventory: 1990-2008.
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Global Flows of Carbon

(Petagrams of Carbon/Year)



* Deforestation
contributes
between 1 - 2

GHG Emissions Reductions Policies: Impacts to U.S. Agriculture

▶ Historical perspective:

- ▶ Clinton Administration promoted crediting of forestry and agricultural “sinks” in international climate negotiations – 1997
- ▶ Agricultural “sinks” receive support of U.S. Agricultural Sector (Farm Bureau, Corn Growers, others) in 1999 international climate negotiations in The Hague – but negotiations crashed over sinks
- ▶ *Decade of research, little attention*
- ▶ Now: *significant* attention internationally and in the U.S. to land use, land use change, and agriculture as a means to help reduce emissions



Potential CO₂ Reduction Options

	Rapidly Deployable	Not Rapidly Deployable
Minor Contributor <0.2 PgC/y	<ul style="list-style-type: none"> • Biomass co-fire electric generation • Cogeneration and Hydropower • Natural Gas Combined cycle • Niche options 	<ul style="list-style-type: none"> • Photovoltaics • Ocean fertilization
Major Contributor >0.2 PgC/y	<ul style="list-style-type: none"> • C sequestration in Agricultural soils • Improved efficiency • Industrial Non-CO₂ gas abatement • Ag non-CO₂ gas abatement (CH₄, N₂O) • Reforestation 	<ul style="list-style-type: none"> • Biomass to hydrogen • Biomass to fuel • Cessation of deforestation • Energy-efficient transport • Geologic storage • High efficiency coal technology • Large-scale solar • Next generation nuclear fission

GHG Emissions Reductions Policies: Impacts to U.S. Agriculture

- ▶ US Legislature: 110th Congress (2007- 2009)
 - ▶ 165 climate change bills, resolutions, amendments introduced by July, 2007*
 - ▶ 11 major bills in Senate, 10 in House, would/might provide some credit to agriculture for emissions reductions activities
- ▶ Some highlights
 - ▶ June 2008: the **Lieberman-Warner Climate Security Act of 2008** debated by full Senate (did not pass)
 - ▶ **Stabenow Offsets Amendment** supported by major ag groups: increased domestic offsets, gave programmatic authority to USDA rather than EPA)
- ▶ 111th Congress (2009 - 2011)
 - ▶ 1 Successful Climate Bill in U.S. House (**Waxman-Markey, 2009**) included agricultural offsets provision – (2,000 MMTCO₂e/year in offsets – including from agriculture) – but Senate unable to move a bill, and no action on this issue since
 - ▶ Widely viewed as most ambitious of all bills contemplated on floor of either house
- ▶ No further legislative action on climate anticipated for at least 5 years....

GHG Emissions Reductions Policies: Impacts to U.S. Agriculture

- ▶ **Critical Take-Aways of U.S. Historical Perspective:**
 - ▶ Agriculture always viewed as a non-capped sector by US
 - ▶ Hard/impossible to cap, regulate millions of small actors
 - ▶ Voluntary engagement opportunities promoted: offsets, ecosystem service markets (largely undeveloped)
 - ▶ Land-based emissions not initially viewed as critical technical factor to mitigate climate change
 - ▶ Agricultural sector viewed as politically important – energy intensive sector
 - ▶ International & U.S. recognition that land-based emissions critically important to combat climate change, incl. agriculture
 - ▶ Voluntary agricultural GHG emissions reductions opportunities central tenant of U.S. policies, programs

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Sustainable Agricultural Solutions for the Carbon Market: The USDA Experience



GHG Emission Reduction Policies: Key Agricultural Initiatives in the U.S.

USDA NRCS GHG CIG GRANTS: \$7.4M in May, 2010

C-AGG – Matching Grants, to Support Collaboration, Shared Learning

- ▶ **Bovine Innovative GHG Solutions (BIGGS)**
- ▶ **Dairy Farm Stewardship Toolkit (Dairy)**
- ▶ Soil Carbon in the Palouse Region (AEP)
- ▶ **Smart Nitrogen Application Program (SNAP)**
- ▶ **Avoided Grassland Conversion Carbon Project (DU)**
- ▶ Demonstrating GHG Emissions Reductions in California and MidSouth Rice Project (EDF)
- ▶ **Nutrient Management for Nitrous Oxide Reductions (Delta Institute and NWF)**
- ▶ **Estimating N₂O Reductions from Nutrient Management in Chesapeake Watershed (CBF)**

GHG Emissions Reductions Policies: Key Agricultural Initiatives in the U.S.

- ▶ **USDA has tripled Climate Change Program budget in past 4 years**
 - ▶ Developing tools, methodologies to better estimate on-farm GHG and emissions reductions, and simulate emissions reductions options based on changes in management practices (e.g., **COMET-FARM**)
 - ▶ **Rapid C Assessment** – now available online: NRCS collected 14,500 soil samples at 6,000 locations nationwide to develop reliable quantitative estimates of soil carbon under different land cover and ag management practices – essential information for markets, credits

GHG Emissions Reductions Policies: Key Agricultural Initiatives in the U.S.

- ▶ **USDA to establish 7 regional “climate hubs” to work in partnership with foresters and producers**
 - ▶ outreach and extension to farmers, ranchers, forest owners, based on science-based risk management
 - ▶ seek to partner with land-grant universities, Extension Service, and private sector
 - ▶ Northeast, Midwest, Southeast, Northwest Plains, Southern Plains, Pacific Northwest, and Southwest
- ▶ **USDA recently awarded \$9.9M to dairy industry to develop its innovative sustainability tool, called *FarmSmart*, which helps dairy farmers calculate their environmental footprint, including GHG**

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Examples of Agricultural Offset Protocols in U.S. Carbon Markets: *Voluntary Registries*

 American Carbon Registry® <i>Trusted solutions for the carbon market</i> 	(ACR)	Protocol Status
N ₂ O Emissions Reductions through Changes in Fertilizer Management		Approved
N ₂ O Emissions Reductions through Reduced Use of Fertilizer on Agricultural Crops		Approved
Emission Reductions in Rice Management Systems		Approved
Avoided Conversion of Grasslands and Shrublands to Crop Production		Pending
Grazing Land and Livestock Management		Pending

Note: ACR is an approved Offset Project Registry (OPR) for the CA Cap-and-Trade Program. As an OPR, ACR will work with ARB to register and issue California-eligible Registry Offset Credits (ROCs) developed using ARB's protocols. ROCs are eligible to be transitioned into ARB compliance offset credits that may be used in the CA Program.



Examples of Agricultural Offset Protocols in U.S. Carbon Markets: *Voluntary Registries*

 Climate Action Reserve (CAR)	Protocol Status
Nitrogen Management in Crop Production	Approved
Rice Cultivation	Approved
U.S. Livestock	Approved
Avoided Conversion of Grasslands and Conversion of Croplands to Grasslands (Soil Carbon Management)	Scoping

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Examples of Agricultural Offset Protocols in U.S. Carbon Markets: *Voluntary Registries*

 <p>VCS VERIFIED CARBON STANDARD A Global Benchmark for Carbon</p>	Protocol Status
Adoption of Sustainable Agricultural Land Management	Approved
Soil Carbon Quantification Methodology	Approved
Quantifying N ₂ O Emissions Reductions in Agricultural Crops through Nitrogen Fertilizer Rate Reduction	Approved
Livestock and Manure Management Methodologies	Approved



Examples of U.S. Carbon Markets: CA Cap-and-Trade Market

- ▶ **All eyes are now on the CA Cap-and-Trade Program**
 - ▶ Implementation began January, 2013
 - ▶ Enforceable cap that will decline over time
 - ▶ Offsets, including agricultural offsets, are allowed
 - ▶ C-AGG continues dialogue with CA policymakers, sharing lessons learned, viable approaches
- ▶ **1 CA agricultural protocols currently approved**
 - ▶ Livestock projects/anaerobic digesters
- ▶ **1 rice protocol (CA and mid-south) under development, likely approved January 2014**
- ▶ **Others likely to be developed: N management?**



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Responses to a Constrained Carbon/GHG Future: U.S. Perspective

- ▶ Legislative options largely viewed as not tenable in next 5-10?? years
- ▶ However, US Senate Agriculture Chairwoman Stabenow likely to address climate risks and opportunities, post-Farm Bill
- ▶ Administrative options/responses:
 - ▶ USEPA
 - ▶ USDA
 - ▶ White House
 - ▶ Executive Orders, e.g., 13514

Responses to a Constrained Carbon/GHG Future: U.S. Perspective

▶ Carbon tax:

▶ PROS:

- ▶ some political traction on both ends of political spectrum
- ▶ rumors of Administration weighing pros and cons
- ▶ both environmental and conservative ngo's signaling some level of support, given legislative stalemate
- ▶ economists have always viewed this as most efficient approach

▶ CONS:

- ▶ Political 3rd rail?
- ▶ Socially Regressive

Responses to a Constrained Carbon/GHG Future: U.S. Perspective



Responses to a Constrained Carbon/GHG Future: U.S. Perspective

- ▶ **Cap-and-Trade:**
 - ▶ all eyes on CA – proof of concept
 - ▶ regional groups continue to struggle
 - ▶ EU ETS continues to struggle
 - ▶ Technical problems
 - ▶ Anticipated global participation not achieved
 - ▶ New players creating, entering markets, including Japan, China
 - ▶ CA linked with Quebec, exploring linkages with China

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Agriculture's Potential Role in Sustainability & Sustainable Supply Chain Initiatives

- ▶ Agriculture increasingly targeted by sustainable supply chain initiatives (SSCI) – part of supply chain
 - ▶ Multinational corporations setting public sustainability commitments
 - ▶ Consumer desire for sustainable products
 - ▶ Corporate social responsibility and investor demand
 - ▶ Complete disconnect between industrial approaches and agricultural approaches for measuring sustainability
 - ▶ Point sources v biological ecosystems
 - ▶ Factory approach v individual farm-based management approaches
 - ▶ Daily, weekly, monthly, seasonal variations in agriculture
 - ▶ Value proposition to ag sector needs to be there
 - ▶ Collaboration, dialogue between SSCI and agriculture essential to make these work! Currently, very limited....

Agriculture's Potential Role in Sustainability & Sustainable Supply Chain Initiatives

- ▶ Agriculture becoming increasingly data-driven
 - ▶ Much data exists in (contiguous) US on climate, soils, weather
 - ▶ ***Much harder to get***: management practices, irrigation, cropping systems, fertilizer use – highly variable, individual
- ▶ Measurement, monitoring, verification
 - ▶ must balance costs and accuracy
 - ▶ Confidentiality, privacy: huge issues for agriculture
- ▶ Lack of good data – particularly for non-CO₂ gases: incentivize new technologies, better data collection, measurement techniques
- ▶ New technology, apps, data sharing initiatives underway – but harmonization, standardization still lacking



Take-Aways

- ▶ Significant market-based, voluntary opportunities for agriculture in carbon and ecosystem markets developing – but still in early stages of development, in many cases
- ▶ Confluence of looming regulatory pressures, sustainable supply chain initiatives provides increased impetus for agricultural engagement and support for market-based opportunities
- ▶ **DATA is the key** – need data to measure, report, show progress – but value proposition for AG SECTOR needs to be at least as great as value for those seeking the data

www.c-agg.org

