Voluntary Reporting of Greenhouse Gases in Agriculture

John Brenner
USDA-NRCS
WNTSC
AQAC Team
Portland, OR
1605(b) Program Background


• Flexible implementing guidelines issued 1994.

• Over 200 regular reporters.

• Agriculture has had limited participation.
Emissions Inventory – Potential Sources of Emission and Sequestration

- Stationary Source Combustion
- Mobile Source Combustion
- Non-Fuel Use of Fossil Fuels
- Industrial Process Emissions
- Mining, Oil, and Gas Production Emissions
- Waste Treatment and Handling
- Indirect Emissions from Purchased Electricity, Steam, Hot and Chilled Water
- Other Indirect Emissions
- Forestry Sources and Sinks
- Agricultural Sources and Sinks
- Engineered Sequestration

M Friedrichs, DOE, 2005
Revision Process – 2005 and 2006


• April 26/27 and May 5: Public workshops.

• May 23: Comment period closes [extended to June 22].

• September 20: Guidelines become effective [unless extended].

• Fall 2005: EIA issues forms (after public review).

• First reports under revised guidelines: Summer 2006.

M Friedrichs, DOE, 2005
Agriculture Activities Covered

• Crop Production
• Grazing Livestock
• Confinement Feeding
• Residue Burning
GHGs Sources and Sinks

**N₂O sources:**
- fertilizer applications
- nitrogen fixing plants
- crop residue
- livestock waste
- residue burning
- cultivation of organic soils

**CH₄ sources:**
- enteric fermentation
- rice production
- livestock waste
- residue burning

**CO₂ sources:**
- lime applications
- fossil fuel combustion
- cultivation of organic soils

**CO₂ sinks:**
- sequestration in soils
- sequestration in biomass
Summary of Improvements to the Reporting System for Agriculture

- Includes all sources and sinks
- More thorough explanation of processes
  - Links to other references
- Expanded range & variety of estimation tools
  - Increased number of acceptable methods
- Reliability ratings
- Availability of default methods and guidance for direct sampling
Why Report?

• To demonstrate the results of your entity’s commitment to reducing GHG emissions.

• To establish an official, government record of entity emissions and reductions.

• To initiate a comprehensive program of greenhouse gas emission monitoring and management.

• To document emission reductions that might be recognized by future government policies or programs.

M Friedrichs, DOE, 2005
Voluntary Reporting of Greenhouse Gases CarbOn Management Evaluation Tool (COMET-VR)

Demonstration of a new web based USDA-Natural Resources Conservation Service tool that is part of the voluntary reporting system
Welcome to the Voluntary Reporting Carbon Management Online Tool (Beta)

Introduction

The Voluntary Reporting of Greenhouse Gases-Carbon Management Evaluation Tool (COMET-VR) tool is a decision support tool for agricultural producers, land managers, soil scientists and other agricultural interests.

COMET-VR provides an interface to a database containing land use data from the Carbon Sequestration Rural Appraisal (CSRA) and calculates in real time the annual carbon flux using a dynamic Century model simulation.

Users of COMET-VR specify a history of agricultural management practices on one or more parcels of land. The results are presented as ten year averages of soil carbon sequestration or emissions with associated statistical uncertainty values. Estimates can be used to construct a soil carbon inventory for the 1605(b) program.

Click Here! to start the Voluntary Report COMET-VR or use the navigation link “COMET-VR Tool” at the top of the page.
COMET-VR

BACKGROUND

• 20 Land Resource Regions with subdivisions

• Century SOM Model with an uncertainty estimate

• Ave of 4.9 million records per LRR (98 mil total)
  Takes ~5 working days to recalculate entire dataset
  Difficult to manage such a large dataset
COMET-VR

APPLICATION

• WEB based

• Crop production
  SOIL CARBON emissions and sequestration
  Fuel and energy use (estimate or user specified)

• Grazing livestock
  SOIL CARBON emissions and sequestration
Agricultural Experiments
Methods

• Use Century to model the management impacts on SOC storage based on field experiments
  - 60 experiments with over 800 treatments

• Statistically evaluate differences between the model results and field measurements for SOC storage
  - linear-mixed effect model reflecting uncertainties in model and measurements
  - prediction error for the LRR carbon estimates
Required Responses to Utilize COMET-VR

• Location
  – State and County
• Parcel Information
• Soils Information
  – Soil Texture/Hydric Condition
• Management History (crop rotations, tillage systems or grazing systems)
  – Pre 1970’s
  – 1970’s-1990’s
  – Base: 1990’s-Current
  – Reporting Period: Current + 10 years
Modeling Procedure

Survey Data: Land Use and Mgmt Data (CSRA)

Spatial Data: Soils and Climate

Century SOM Model

WEB INTERFACE

Results 1605b

Response returned in < 5 seconds

Uncertainty Estimator

Experiments
On Line Demonstration
Amarillo, TX

www.cometvr.colostate.edu
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Voluntary Reporting Carbon Management Tool (Beta)

Step 1. Enter the State Information: Select the State where the parcel is located from the list of State Names.

Select a State: Texas
Voluntary Reporting Carbon Management Tool (Beta)

**Step 2. Enter the County Information:** Select the County where the parcel is located from the list of County Names.

**Texas County Selection:**

Select a County: POTTER

Go to | Reset | State | County |
Voluntary Reporting Carbon Management Tool (Beta)

Step 3. Specify your parcel's information: Enter the parcel name, parcel size, and measurement units.

POTTER County, Parcel Selection:

Enter the reporting date: 6/13/2005
Enter a name (optional): NW Quarter

Measurement Units?: English Metric
Parcel Size?: 160 Acres

Selection
Location Information:
- County: POTTER
- MLRA: 77E
- LRR: HS

Parcel Information:

Soil Information:

Management History:
Voluntary Reporting Carbon Management Tool COMET-VR (Beta)

Step 4. Enter the Soil Information: Select the dominant soil texture and hydric information for your parcel.

Select the surface soil texture:
- Clay Loam
- Loam
- Loamy Sand
- Silty Clay Loam
- Silt Loam
- Sandy Loam

Is this a hydric soil?
- Select No
- Select Yes

Location Information:
- State: Texas
- County: POTTER
- MLRA: 77E
- LRR: HS

Parcel Information:
- Report Date: 6/13/2005
- Name: NW Quarter
- Size: 160 Acres

Soil Information:

Management History:
Step 5. Enter the land management information: Choose a rotation for the four time periods.

Enter the management history for this parcel:

Management For This Time Period:

- Landscape position and historical management:
  - Irrigation (pre 1970's)
  - Livestock grazing (pre 1970's)
  - Lowland non-irrigated (pre 1970's)
  - Upland non-irrigated (pre 1970's)

1970's through mid-1990's:

- Dryland continuous cotton
- UF Pinelands cotton
- Irrigated continuous cotton
- Irrigated: winter wheat-milo-corn
- Livestock grazing: rotational (>8 pastures), moderate grazing
- Livestock grazing: rotational (≤8 pastures), moderate grazing

Enrollment in Conservation Reserve Program (CRP) during 1980's?

Select the CRP type:

- None
- 100% grass
- Grass-legume mixture

Base (Current Mgmt):

- CRP, 100% grass
- CRP, grass-legume mixture
- Dryland continuous cotton
- Irrigated continuous cotton
- Irrigated: winter wheat-milo-corn

2005 Report Period:

- CRP, 100% grass
- CRP, grass-legume mixture
- Dryland continuous cotton
- Irrigated continuous cotton
- Irrigated: winter wheat-milo-corn

See Also:

- NREL Agroecosystems
- CASNRG Consortium for Agricultural Soils
- Mitigation of Greenhouse Gases
- ARS Research
- U.S. Agriculture & Forestry Greenhouse Gas Inventory
- Greenhouse Gas Reporting Guidelines
- Draft 1605b Technical Guidelines
- Voluntary Reporting Program
Voluntary Reporting Carbon Management Tool COMET-VR (Beta)

Step 6. Enter the land management information: Choose a tillage for the three time periods.

POTTER County, Texas Tillage History for NW Quarter

<table>
<thead>
<tr>
<th>Tillage For this Time Period:</th>
<th>Choose Tillage:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970's through mid-1990's:</td>
<td>Intensive Tillage</td>
</tr>
<tr>
<td></td>
<td>Reduced Tillage</td>
</tr>
<tr>
<td></td>
<td>No Till Tillage</td>
</tr>
<tr>
<td>Base (Current Mgmt.):</td>
<td>Intensive Tillage</td>
</tr>
<tr>
<td></td>
<td>Reduced Tillage</td>
</tr>
<tr>
<td></td>
<td>No Till Tillage</td>
</tr>
<tr>
<td>2005 Report Period:</td>
<td>Intensive Tillage</td>
</tr>
<tr>
<td></td>
<td>Reduced Tillage</td>
</tr>
<tr>
<td></td>
<td>No Till Tillage</td>
</tr>
</tbody>
</table>

Selection

Location Information:
- **State:** Texas
- **County:** POTTER
- **MLRA:** 77E
- **LRR:** HS

Parcel Information:
- **Report Date:** 6/13/2005
- **Name:** NW Quarter
- **Size:** 160 Acres

Soil Information:
- **Texture:** Clay Loam
- **Hydric:** None

Management History:
- **Historic:** irrigation (pre 1970's)
- **70's - 90's:** dryland; winter wheat-milo., CRP: None
- **Current:** dryland; winter wheat-milo.,
- **Report Period:** dryland: winter wheat-milo.,

USDA COMET-VR Online Tool Version: 1.0b-062004
Voluntary Reporting Carbon Management Tool COMET-VR (Beta)

Go to | Reset | State | County | Parcel | Soil | Rotation | Tillage | Submit |

Please Verify the information by reviewing the gray "SELECTION BOX" to the right before submitting.

POTTER County, Texas COMET-VR Submit Information:

Soil Carbon Calculation
If you find any problems with the information that you input, you can easily correct the problem by using the navigation links at the top of this form to jump back to the section needing correction. For example, if the acreage/hectare value for your parcel is incorrect, just click on the link "parcel". Then input the correct value and click on the next button. Review the Selection box to the right of the screen. The value should be corrected.

After correcting the information, click on the "Submit" link at the top of the page to return to the execution page.

When you click on the "Get Carbon" button you will be sending your information to the century program to compute the predicted change in Soil Carbon for the parcel NW Quarter, POTTER County, Texas.

This is a complex calculation and may take a few seconds, so Please be patient.

Back | Reset | Get Carbon

USDA COMET-VR Online Tool Version: 1.0b-062004
Values are valid for 2005 through 2015 assuming that no change in management occurs.

The default values, or your specified values for soil carbon, may be reported in the 1605(b) system. We recommend that you print this page and save a copy of this report to a file on your computer system. Use the button "Write File" on the Next page to save this report.

Getting data from the database

POTTER County, Texas Century's Dynamic Carbon Database COMET-VR Summary:

Carbon Storage Report

Report Year: 2005

<table>
<thead>
<tr>
<th>Parcel Description</th>
<th>Parcel Management History</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parcel Name: NW Quarter</td>
<td>Historic: irrigation (pre 1970's)</td>
</tr>
<tr>
<td>Parcel Size: 160 Acres</td>
<td>70's to 90's: dryland; winter wheat-milo; Intensive Tillage</td>
</tr>
<tr>
<td>Location: POTTER, Texas</td>
<td>Current: dryland; winter wheat-milo; Intensive Tillage</td>
</tr>
<tr>
<td>Soil: Non-hydrionic Clay Loam</td>
<td>Report Period: dryland; winter wheat-milo; No Till Tillage</td>
</tr>
</tbody>
</table>

Predicted Change in Soil Carbon for the Parcel

Annual Change for 2005

<table>
<thead>
<tr>
<th>Change in Carbon</th>
<th>% Uncertainty</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Tons Carbon per year: 7</td>
<td>6.38</td>
</tr>
<tr>
<td>Total Tons CO2 Equivalent per year: 25</td>
<td>6.36</td>
</tr>
</tbody>
</table>

Values recorded in English units. One ton of carbon is equivalent to 3.664 tons of carbon dioxide.
Values are valid for 2005 through 2015 assuming that no change in management occurs.
The default values, or your specified values for soil carbon, may be reported in the 1605(b) system. We recommend that you print this page and save a copy of this report to a file on your computer system. Use the button "Write File" to save this report.

**POTTER County, Texas Century’s Dynamic Carbon Database COMET-VR Summary:**

**Dynamic Century Carbon ONLINE Tool - COMET-VR**

**Fuel and Fertilizer**

**Report Date:** 2005  
**Parcel Description:** NW Quarter, POTTER County, Texas

<table>
<thead>
<tr>
<th>1996 to 2005* Base (Current Management)</th>
<th>2006 to 2015* Reporting Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. 2 Diesel Use from Tillage</td>
<td>Gallons</td>
</tr>
<tr>
<td>Nitrogen Fertilizer Use</td>
<td>Gallons</td>
</tr>
<tr>
<td></td>
<td>0 Total Lbs</td>
</tr>
<tr>
<td></td>
<td>0 Total Lbs</td>
</tr>
</tbody>
</table>

* Values calculated from the Dynamic LRR database for 2005

**Enter Actual changes in inputs for this parcel**

<table>
<thead>
<tr>
<th>Base</th>
<th>Reporting Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. 2 Diesel</td>
<td>Gallons</td>
</tr>
<tr>
<td>Gasoline</td>
<td>Gallons</td>
</tr>
<tr>
<td>Propane</td>
<td>Gallons</td>
</tr>
<tr>
<td>Biodiesel</td>
<td>Gallons</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>MCF</td>
</tr>
<tr>
<td>Electricity</td>
<td>Kw-hr</td>
</tr>
<tr>
<td>Nitrogen Fertilizer</td>
<td>Lbs</td>
</tr>
</tbody>
</table>

* Enter only those applicable

Back | Reset | Write File
An ASCII Text file is available by clicking on the link provided on this page. This Text File will only be available for a limited time. Please print and/or save to your local computer.

Note: Please use your browser's back button to return to the COMET-VR Tool if you LEFT click on the ASCII Report link.

Your information has been saved to a file.

- Please RIGHT click on the link to SAVE this report to your computer. Then select "Save Target As" from the list and enter a file name in the appropriate box.
- Please LEFT click on the link to READ or Print this report using your browser.
- File your report using the "Send Email" button.
BACKGROUND INFORMATION
******************************************************************************
******************************************************************************
1. Parcel Description:

   Name: NW Quarter, POTTER County Texas;
   Size: 160 Acres;
   LRR: HS;
   MLRA: 77E;
   Soil: Clay Loam;
   Hydric: N;

2. Parcel Management History:

   HISTORIC - irrigation (pre 1970's);
   70's to 90's - dryland: winter wheat-milo; Tillage: Intensive;
   CRP: None;
   BASE (CURRENT Hqnt) - dryland: winter wheat-milo; Tillage: Intensive;
   REPORT PERIOD - dryland: winter wheat-milo; Tillage: No Till;

CARBON STORAGE REPORT
******************************************************************************
******************************************************************************
1. Predicted Annual Change in Soil Carbon for the Parcel - NW Quarter
   During the Reporting Period:

   Total Tons Carbon per year: 7 Uncertainty: 6.38;
   Total Tons CO2 Equivalent per year: 55 Uncertainty: 6.38;

FUEL AND FERTILIZER USE REPORT
******************************************************************************
******************************************************************************
1. Calculated from the Dynamic LRR database for:

   Base No. 2 Diesel Use from Tillage: 1,189 Total Gallons
   Report Period No. 2 Diesel Use from Tillage: 273 Total Gallons

   Base Nitrogen Fertilizer Use: 0 Total Lbs
   Report Period Nitrogen Fertilizer Use: 0 Total Lbs

2. Actual changes in inputs for this parcel:

   NONE Reported;

******************************************************************************
******************************************************************************
This report was created using the Online Carbon Reporting Tool on 6/14/2005
Report id: _2606_2581_et_2585_et_2587_4t

Note: The Base is 1996 to 2005; and the Report Period is 2006 to 2015
(NA) denotes data not available.
Voluntary Reporting Carbon Management Tool COMET-VR (Beta)

An ASCII Text file is available by clicking on the link provided on this page. This Text File will only be available for a limited time. Please print and/or save to your local computer.

Note: Please use your browser's button to return to the COMET-VR Tool if you LEFT click on the ASCII Report link.

POTTER County, Texas Century’s Dynamic Carbon Database COMET-VR File Output:

Your information has been saved to a file.

- Please RIGHT click on the link to SAVE this report to your computer. Then select “Save Target As” from the list and enter a file name in the appropriate box.
- Please LEFT click on the link to READ or Print this report using your browser.
- File your report using the “Send Email” button.

Saved File Link: ASCII Report

Back Reset
Participants

• Colorado State University - Natural Resource Ecology Laboratory
  – Keith Paustian, Kendrick Killian, Steve Ogle, Mark Easter, Steve Williams

• USDA
  – NRCS – John Brenner, Jill Schuler, Joel Brown and Maury Mausbach (retired)
  – ARS - Ron Follett, Steve Shafer and Mike Jawson
  – GCPO - Bill Hohenstein and Kathryn Bickel
On Line Demonstration
Amarillo, TX

www.cometvr.colostate.edu