Tools and Methods to Manage Carbon Sequestration in Agriculture and Forestry

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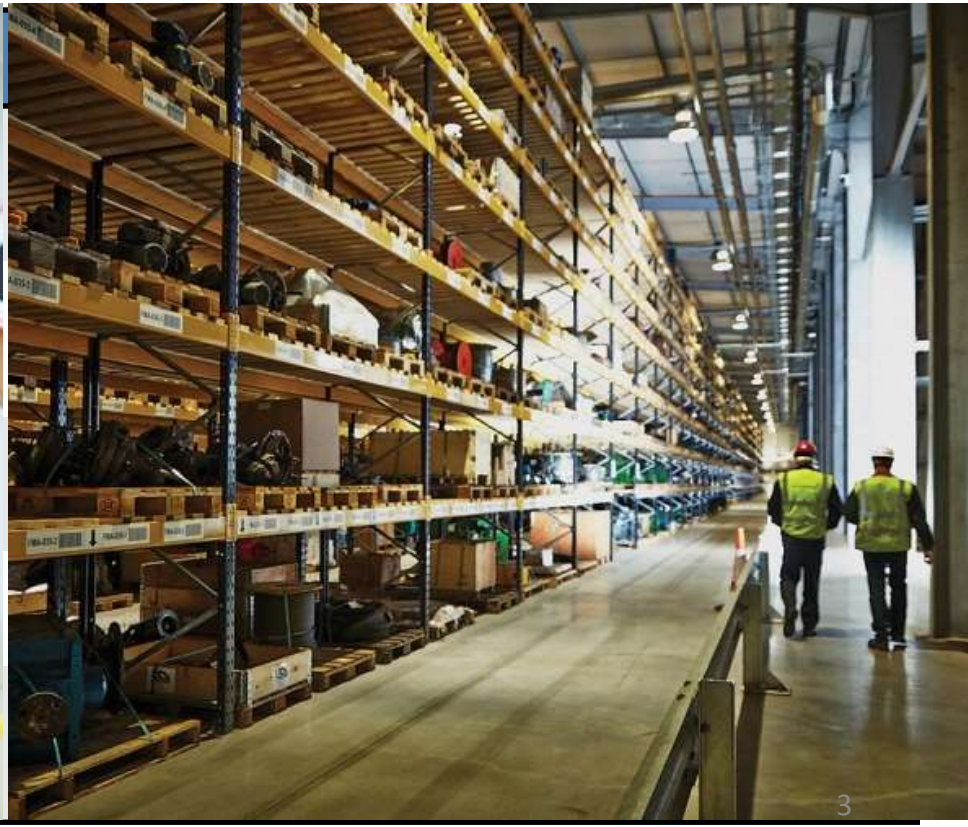
Policy imperative

- UNFCCC commitment
- USDA Building Blocks commitment
- Voluntary carbon markets
- *No regulations on carbon in the land sector*

Different ways of counting for different goals



Different ways of counting for different goals

Inventorying	Accounting
Comprehensive of all emissions/sequestration in a given region	Can be project based
Typically annual, tracks emissions, carbon stock change over time series	Typically uses baseline vs. change to assess impact
Separates emissions by sector	Need to attribute both source and cause (e.g., some management change was made)
Need to attribute source, but not cause	Reductions/sequestration given some value
Used to track progress towards a goal	Additionality, leakage, permanence are considerations

Counting carbon in ag & forestry

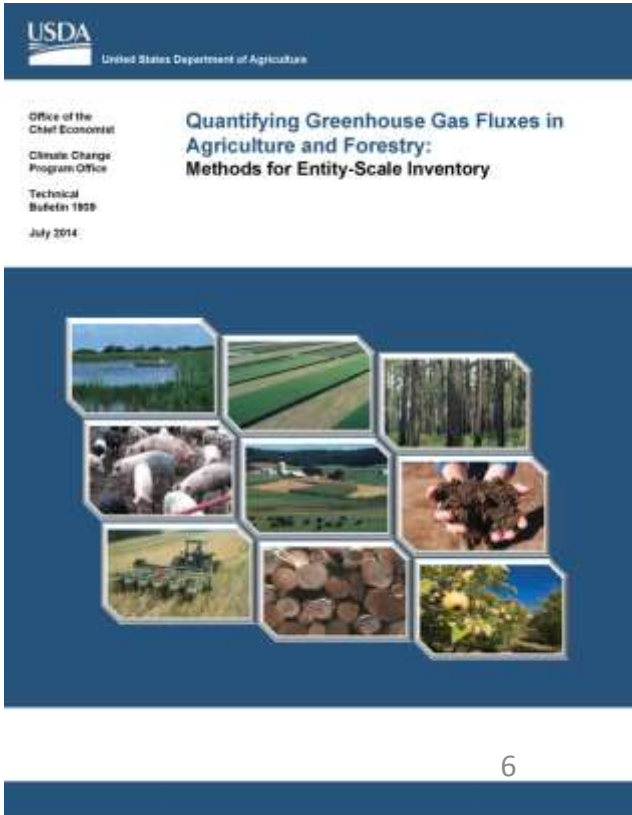
- Accounting and inventorying both need:
  - Accuracy & precision
  - Complete
  - Consistent
  - Transparent
- Data
- Methods
- USDA helping with these
- Both ways are best estimates

USDA entity-scale carbon counting methods

- Our current gold standard

  Quantifying Greenhouse Gas Fluxes in Agriculture and Forestry: Methods for Entity-Scale Inventory. USDA Technical Bulletin 1939. July 2014.

  Available at: usda.gov/oce/climate_change/estimation



Managing for C sequestration

- Cropland: tillage intensity, crop intensity, crop rotation, crop residues, manure

Managing for C sequestration

- Grazing lands: Grazing intensity

Managing for C sequestration

- Agroforestry: riparian buffers, windbreaks, woodlots

Managing for C sequestration

- Forests: stand density, species type, site preparation, rotation length, fire management, land use etc.

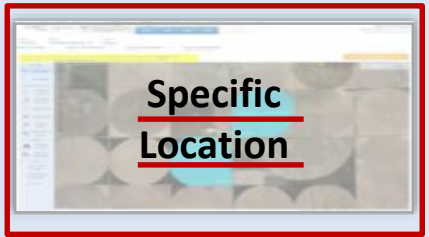
USDA site-specific tools

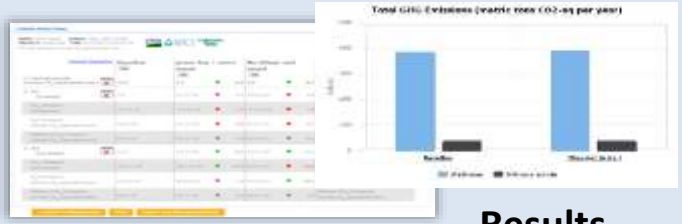
COMET-Farm™

How it works

Web Interface

User inputs their unique Farm or Ranch management.





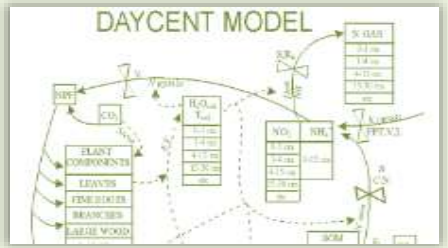
Results

CSU Server

Historic
Rotations
NRI, Cropping
Practices Survey,
CSRA

Climate & Soil
NARR
&
SSURGO

Emission Factors,
USDA Methods,
IPCC



Empirical
Models

Outputs

Croplands

www.comet-farm.com

Identify field locations

Use the new drag & drop feature to create a crop rotation.

User defines the current unique management for their farm or ranch.

User can create future scenarios with management changes that reflect adopting conservation practices.

A report is generated that compares the current management to the future management related to their GHG and carbon balance.

COMET Farm | NRCS USDA | Whole Farm and Ranch Carbon and Greenhouse Gas Accounting System.

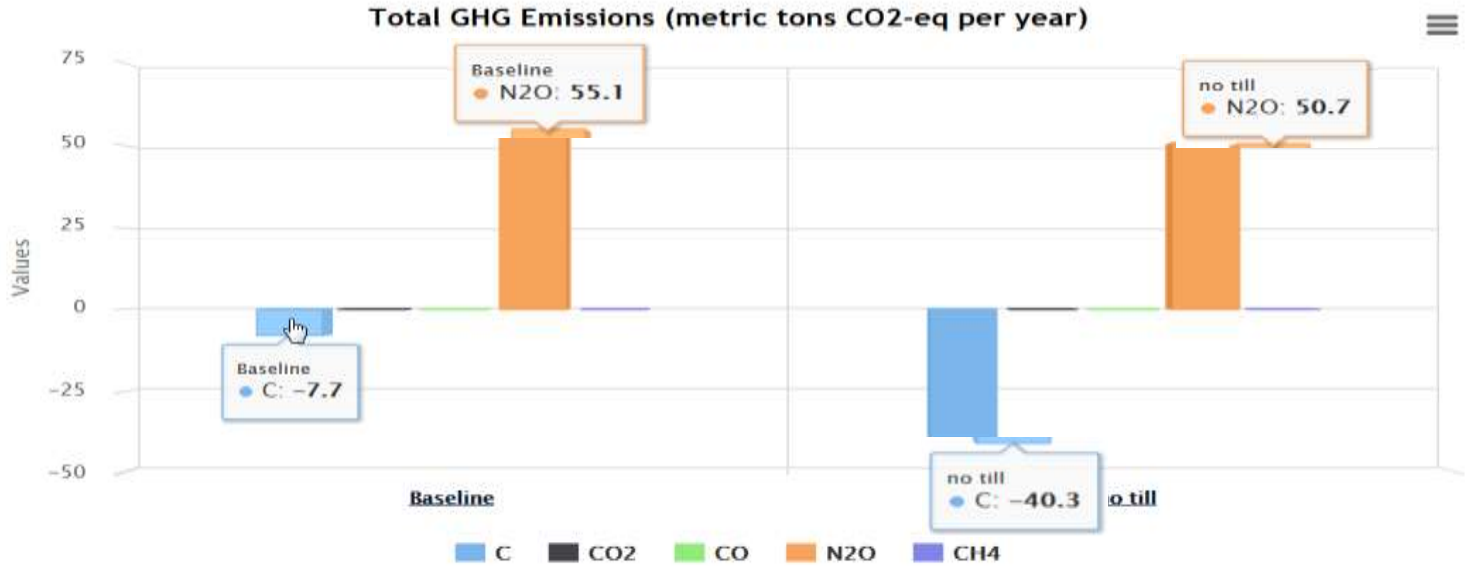
HOME TOOL INFO

Example graphical report from the Cropland demonstration project on COMET-Farm.

Step 1 Activities | Step 2 Field Management | Step 3 Report

Cropland, Pasture, Range | Cropland Graphical Report

Parcel Name: F1



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COMET Farm | NRCS USDA | Whole Farm and Ranch Carbon and Greenhouse Gas Accounting System

Step 1 Activities | Step 2 Field Management | Step 3 Report

Cropland, Pasture, Range | Cropland Graphical Report

NAME: Matt Stermer **RUNID:** 8127_16694_92275
PROJECT: Croplands Demo Project **TIME:** 11/21/2016 3:55:45 PM

USDA NRCS Colorado State University | Report type

Source	Baseline Emissions	no till	
		Emissions	Change
F1 (60 acres - Corn, Soybean)			
C *(tonnes CO_2 equiv./yr.)*	-7.7	-40.3	-32.6
Soil	-7.7	-40.3	-32.6
Biomass Burning	0.0	0.0	0.0
CO_2 *(tonnes/yr.)*	0.0	0.0	0.0
Liming	0.0	0.0	0.0
Urea Fertilization	0.0	0.0	0.0
Drained Organic Soils	0.0	0.0	0.0
CO *(tonnes CO_2 equiv./yr.)*	0.0	0.0	0.0
Biomass Burning	0.0	0.0	0.0
N_2O *(tonnes CO_2 equiv./yr.)*	55.1	50.7	-4.5
Soil	55.1	50.7	-4.5
Wetland Rice Cult.	0.0	0.0	0.0
Biomass Burning	0.0	0.0	0.0
Drained Organic Soils	0.0	0.0	0.0
CH_4 *(tonnes CO_2 equiv./yr.)*	0.0	0.0	0.0
Soil	0.0	0.0	0.0
Wetland Rice Cult.	0.0	0.0	0.0
Biomass Burning	0.0	0.0	0.0
Total	**47.4**	**10.3**	**-37.1**
Total (all parcels)	***47.4***	***10.3***	***-37.1***

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- Example tabular report page for the Cropland demonstration project on COMET-Farm.
- The demonstration project depicts a conventional tilled grain corn-soybean rotation converted to a no-till system.
- The negative green values indicate a reduction in GHG and an increase in carbon sequestration.

COMET-Farm Forestry Module

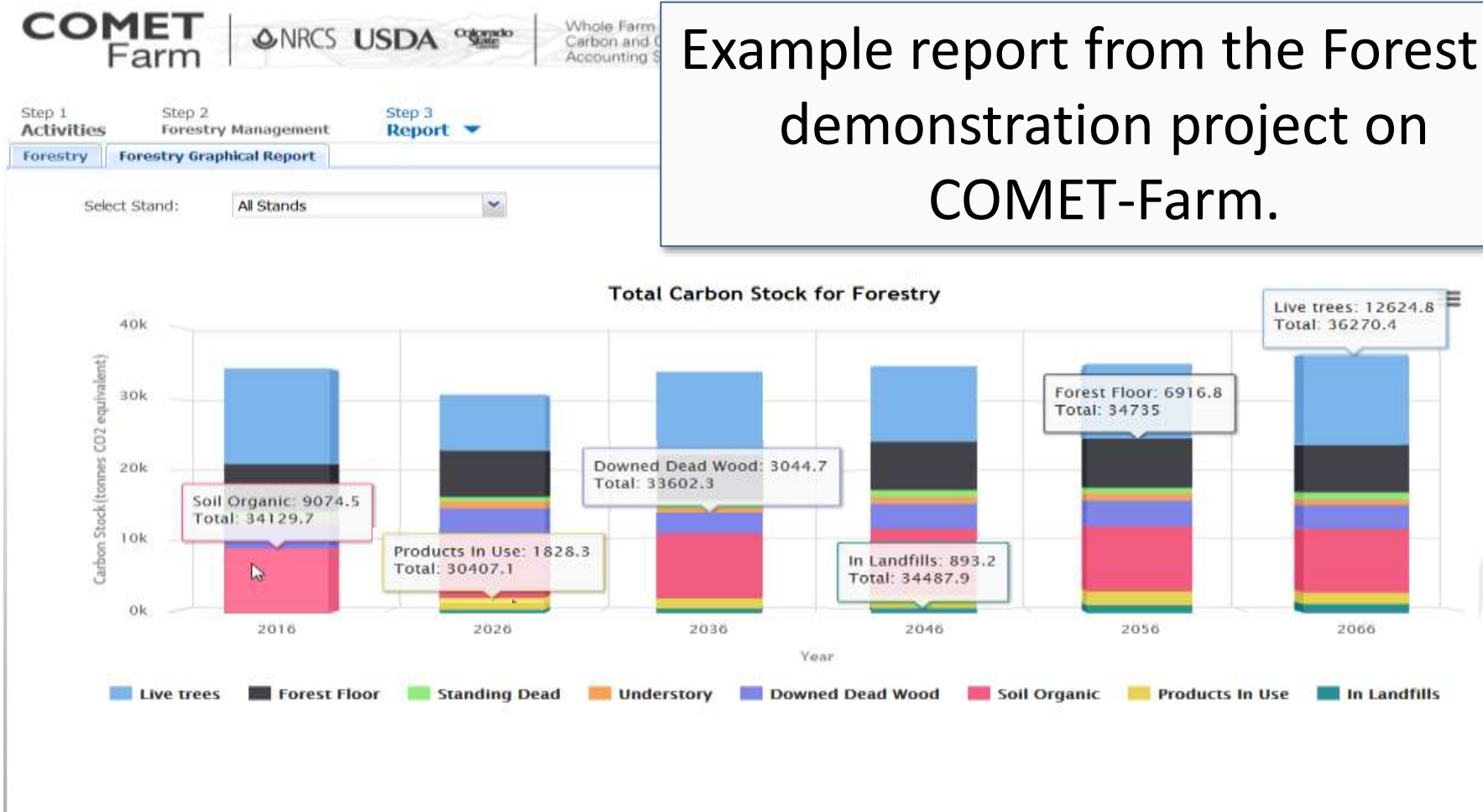
www.comet-farm.com

Identify stand locations

The report shows the sequestration over the next 50 years for all stands.

User defines dominate forest type, past land cover, age or volume, prescription and activity years for each stand.

Example report from the Forestry demonstration project on COMET-Farm.



Source	2016	2026	2036	2046	2056	2066	Average Yearly Emissions
Joe's Cut (Forest Type :Ponderosa pine)-(Prescription:Clear-cut harvesting)							
Live Trees *(tonnes CO2 equiv.)*	726.5	1833.4	3563.1	415.1	837.1	2006.4	-25.6
Standing Dead *(tonnes CO2 equiv.)*	69.2	184.5	345.9	27.7	80.7	200.6	-2.6
Forest Floor *(tonnes CO2 equiv.)*	2237.0	2110.2	2098.6	2506.8	2224.3	2109.0	+2.6
Understory *(tonnes CO2 equiv.)*	495.8	369.0	288.3	547.7	483.1	360.9	+2.7
Downed Dead Wood *(tonnes CO2 equiv.)*	1602.8	1383.7	1279.9	1924.5	1580.9	1373.3	+4.6
Soil Organic *(tonnes CO2 equiv.)*	3955.1	3955.1	3955.1	3955.1	3955.1	3955.1	0.0
Products In Use *(tonnes CO2 equiv.)*	0.0	0.0	0.0	687.0	483.7	388.0	-7.8
In Landfills *(tonnes CO2 equiv.)*	0.0	0.0	0.0	117.0	208.7	248.5	-5
Total	**9086.4**	**9835.9**	**11531.0**	**10181.0**	**9853.7**	**10641.9**	**-31.1**
West Big Meadow (Forest Type :Douglas-fir)-(Prescription:Clear-cut harvesting)							
Live Trees *(tonnes CO2 equiv.)*	8527.0	243.9	736.4	1839.2	97.3	325.6	+164
Standing Dead *(tonnes CO2 equiv.)*	682.4	25.2	74.5	185.0	10.8	32.4	+13
Forest Floor *(tonnes CO2 equiv.)*	2162.4	2066.3	1949.7	1905.3	2169.6	2006.2	+3.1
Understory *(tonnes CO2 equiv.)*	105.7	282.3	251.1	187.4	282.3	282.3	-3.5
Downed Dead Wood *(tonnes CO2 equiv.)*	705.2	1119.6	923.8	812.1	1266.2	1025.9	-6.4
Soil Organic *(tonnes CO2 equiv.)*	2330.6	2330.6	2330.6	2330.6	2330.6	2330.6	0.0
Products In Use *(tonnes CO2 equiv.)*	0.0	1828.3	1357.8	1108.5	1448.4	1147.2	-22.9
In Landfills *(tonnes CO2 equiv.)*	0.0	466.6	675.7	776.2	884.5	1012.0	-20.2
Total	**14513.2**	**8362.8**	**8299.5**	**9144.3**	**8489.6**	**8162.3**	**+127**

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Training resources

On-Demand Training Videos available on YouTube covering all COMET-Farm™ modules and the COMET-Planner™ tool.

Live Webinars on COMET-Farm™ and COMET-Planner™ offered weekly. The training schedule can be found on the COMET-Farm™ 'Help" page.

If you would like to request a training for you or your group contact Matthew Stermer. Matthew.Stermer@colostate.edu

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Using tools

- Help stakeholders make decisions on land management
- Balance of data inputs vs. accuracy
- Big picture: working towards science that is useable

Further resources

- COMET Farm: www.comet-farm.com
- COMET Planner: www.comet-planner.com
- For COMET trainings, contact Matthew.Stermer@colostate.edu
- Forest Tools: http://www.fs.usda.gov/ccrc/tools
- Ecosystem Tools: http://www.oem.usda.gov/tools

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