USDA's Climate Change Plan and Benchmarking Progress

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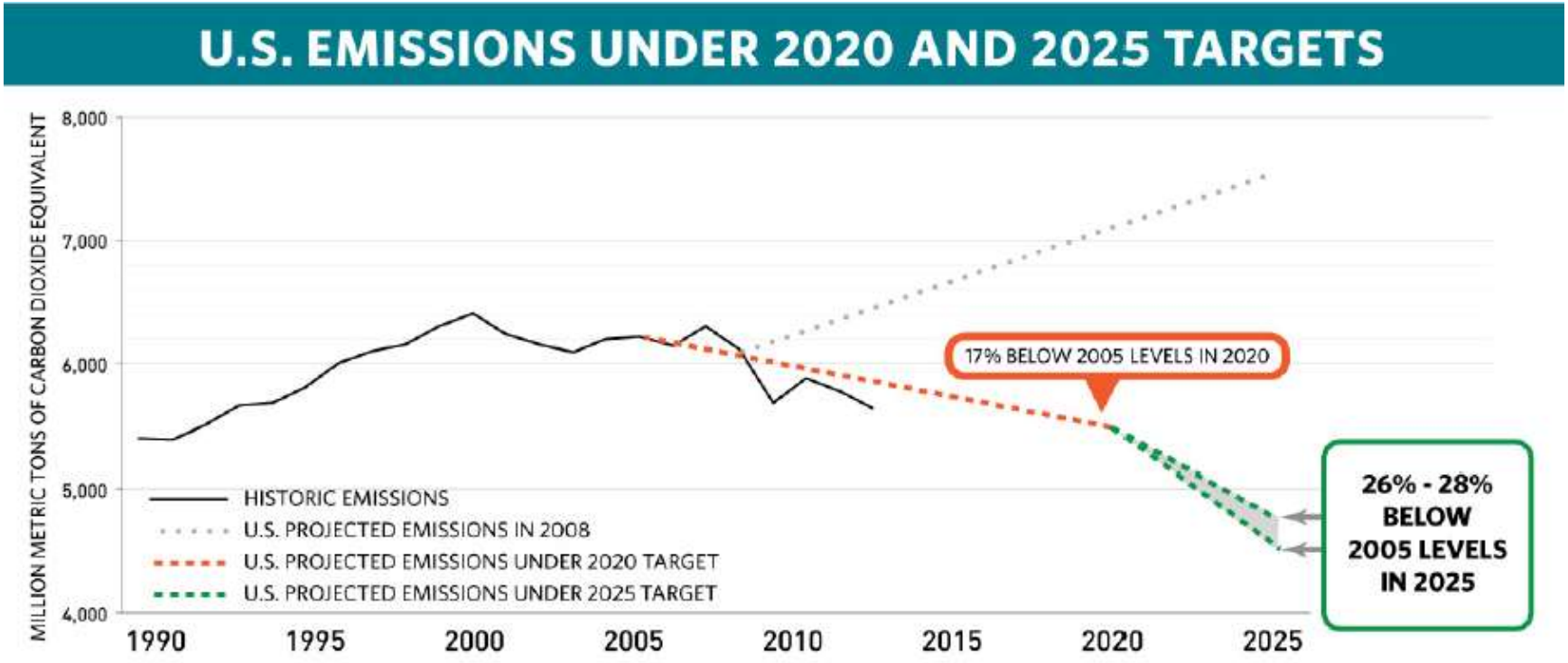
U.S. official commitment to climate change – annual 26-28% reduction in

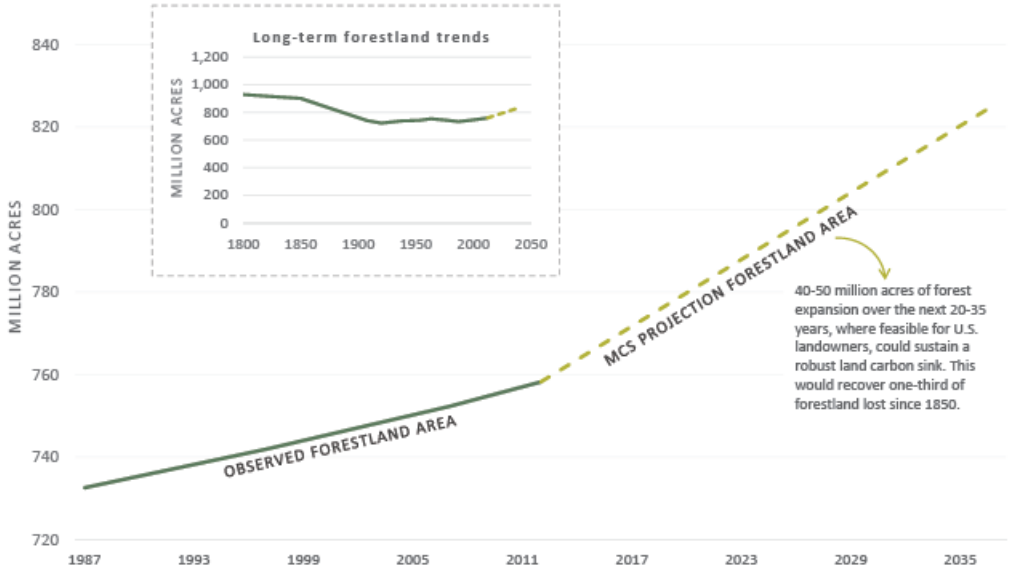


President's Mid-Century Strategy

- I. Transitioning to a low-carbon energy system
- II. Sequestering carbon through forests, soils, and CO_2 removal technologies
- III. Reducing non-CO_2 emissions

Expanded Forest Area

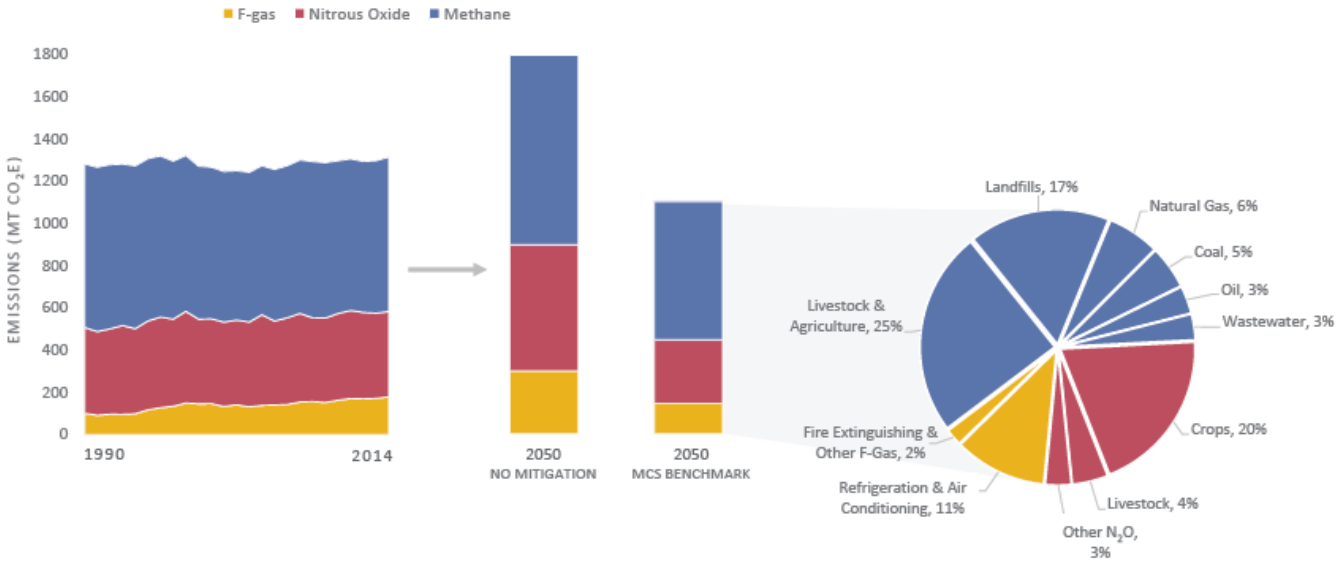
FIGURE E4:
HISTORICAL FOREST EXPANSION COMPARED TO POTENTIAL MCS FOREST EXPANSION



Note: Historic data from 1800 to 2007 based on Kellogg (1909) and Oswalt et al. (2014). To account for uncertainty in observed forest expansion after 2007, this figure shows an average annual increase in forest area from 2007-2012 that reflects a longer-term average trend based on three separate data sources, including the FIA (1987-2007) as found in Oswalt 2014, the 2007 USDA Major Land Use Database (1992-2007) (Nickerson et al. 2011), and the 2015 FAO Global Forest Resources Assessment (1990-2015) (FAO 2016). The resulting average annual increase for the 2007-2012 period is 1.2 million acres/year. 2017-2035 projection based on analysis of forest expansion that could support the MCS Benchmark scenario. Forest expansion is assumed to occur before 2035 in order to achieve desired 2050 carbon sink levels.

Reduction in Ag GHGs

FIGURE E6: U.S. NON-CO_2 MITIGATION BY 2050, COMPARED TO "NO MITIGATION" SCENARIO



Note: "MCS Benchmark" emissions are scaled to be consistent with EPA projections data used in the Global Mitigation of Non-CO_2 Greenhouse Gases report (EPA Report 2014) in order to reflect residual non-CO_2 emissions consistent with U.S. GHG Inventory data. These projections include distinct activity assumptions from those used in GCAM model results displayed in other figures. "No Mitigation" scenarios estimates are per Deep Decarbonization Pathways Project (Williams et al. 2014).

USDA's actions

- Building Blocks for Climate Smart Agriculture and Forestry
  - Reducing net ag/forestry emissions by 120 MMTCO_2e per year by 2025

What is Climate-Smart Agriculture and Forestry?

- Promotes productivity and producer income;
- Improves resilience;
- Reduces and removes greenhouse gas emissions
- Increases renewable energy production from farms and forest biomass.

Principles of the USDA Building Blocks

- Voluntary and incentive-based
- Focused on multiple economic and environmental benefits
- Meet the needs of producers
- Assess progress and measure success
- Cooperative and focused on building partnerships

Building Blocks

- Soil Health
- Nitrogen Stewardship
- Livestock Partnerships
- Conservation of Sensitive Lands
- Grazing and Pasture Lands
- Private Forest Growth and Retention
- Stewardship of Federal Forests
- Promotion of Wood Products
- Urban Forests
- Energy Generation and Efficiency

Soil Health

- **Goal:** Integrate with NRCS Soil Health Initiative to promote conservation practices that improve soil organic matter, reduce emissions from soils and equipment, and promote healthy soil management systems
- **Mitigation target:** 4.0-18.0 MMT CO2e annually by 2025
- **Sample practices:** Permanent no-till, cover crops, rotations with perennial forages, etc.

Nitrogen Stewardship

- **Goal:** Reduce N_2O emissions by: 1) Enrolling/maintaining 64M acres under nutrient management plans,
- 2) Focusing on the 4Rs – right time, right place, right rate, right source.
- **Mitigation target:** 7.0 MMT CO_2e annually by 2025
- **Sample practices:** Spring N applications, N inhibitors, precision agriculture

Livestock Partnerships

- **Goal:** Reduce CH_4 emissions from livestock manure management by installing: 1) 500 anaerobic digesters; 2) impermeable covers with flares on 10% of dairy cattle and swine operations with anaerobic lagoons.
- **Mitigation target:** 21.2 MMT CO2e annually by 2025

Conservation of Sensitive Lands

- **Goals:**
  1. Enroll 400,000 acres of high GHG-potential lands in Conservation Reserve Program
  2. Transfer expiring CRP lands into permanent or long-term easements
  3. Protect 40,000 acres of organic soils (histosols) through easements

Mitigation target: 0.8 MMT CO_2e annually by 2025

Grazing and Pasture Land

- **Goal:** Establish grazing management plans on an additional 9 million acres (for a total of 27 million acres)
- **Mitigation target:** 1.6 MMT CO2e annually by 2025
- **Sample practices:** Prescribed Grazing, Forage and Biomass Planting, Range Planting

Private Forest Growth and Retention

- **Goal:** Through the Forest Legacy Program and the Community Forest program, protect about 1million acres of environmentally important private forest lands from conversion to non-forest uses.
- Through NRCS conservation programs, establish trees and shrubs on an addition 1 million acres of nonindustrial private forest land.
- **Mitigation target:** 4.8 MMT CO_2e annually by 2025

Stewardship of Federal Forests

- **Goal:** Restore or reforest 320,000 acres of damaged, degraded, or recently disturbed (e.g., by wildfire, disease, and insects) lands in the National Forest System
- **Mitigation target:** 2.5 MMT CO_2e annually by 2025

Promotion of Wood Products

- **Goal:** Provide technical assistance to increase the number of wood-product intensive middle-rise buildings built annually from 440 in 2015 to 900 in 2025.
- **Mitigation target:** 19.5 MMT CO2e annually by 2025

Urban Forests

Goal: In partnership with Arbor Day Foundation, plant 100,000 new trees in urban areas over next 10 years.

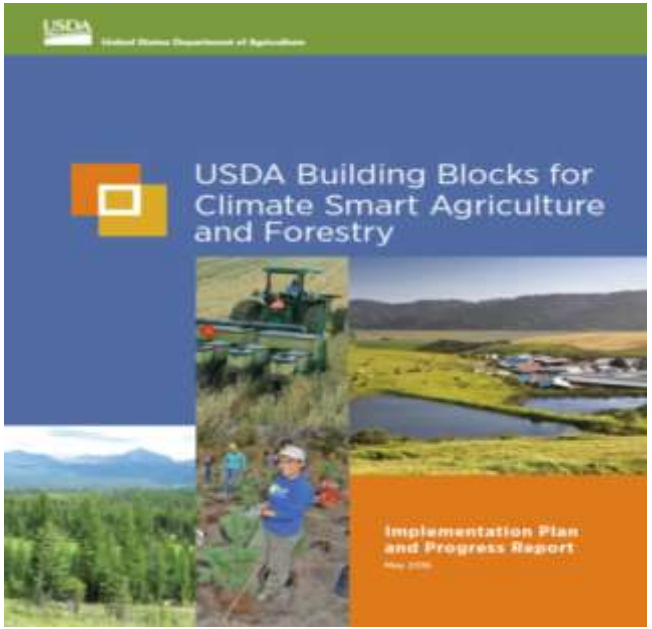
Mitigation target: 0.1 MMT CO_2e annually by 2025

Energy Generation and Efficiency

- **Goal:** Promote renewable energy technologies and energy efficiency through the Energy and Conservation Loan Program, High Energy Cost Grant Program, Rural Energy for America Program, the National On-Farm Energy Initiative, and the Rural House Service Program.
- **Focus:** On-farm, Utility-scale,Rural housing, Bio-based products
- **Mitigation Target:** 60.2 MMT CO_2e annually by 2025

Implementation Plan and Progress Report

- Released May 2016
- Outlines the goals for each building block, GHG benefits
- Reports on progress to date
- Provides implementation plans for each building block
- Summarizes next steps



http://www.usda.gov/climate-smart.html

Building Block Goals

Building Block	Goals (by 2025)
Soil Health	Promote soil conservation practices that improve soil organic matter, reduce emissions from soils and equipment, and promote healthier soils nationwide
Nitrogen Stewardship	Reduce nitrous oxide emissions and provide cost savings through application of 4 “Rs”
Livestock Partnerships	Install 500 anaerobic digesters; install impermeable covers on 10% of dairy cattle and swine operations
Conservation of Sensitive Lands	Enroll 400,000 acres of CRP with high GHG benefits; protect 40,000 acres through easements; transfer expiring CRP acres to permanent easements
Grazing and Pasture Lands	Establish grazing management plans on an additional 9 M acres, for a total of 27 M acres
Private Forest Growth and Retention	Through FLP and CFP, protect almost 1 M acres of working landscapes
Stewardship of Federal Forests	Reforest 32,000 acres per year on National Forest System lands
Promotion of Wood Products	Increase the number of building projects supported through technical assistance from 280 in 2014 to 2,000 in 2025
Urban Forests	Plant 100,000 additional trees in urban areas
Energy Generation and Efficiency	Promote renewable energy technologies and improve energy efficiency through EECLP, REAP, and NOFEI (EQIP), and RHS programs

Partnerships

The Fertilizer Institute
Nourish, Replenish, Grow

The Nature Conservancy

Equilibrium Capital

Walmart

United Suppliers

EDF
ENVIRONMENTAL DEFENSE FUND
Finding the ways that work

MONSANTO

Partnerships

THE TRUST for PUBLIC LAND

American Forest Foundation

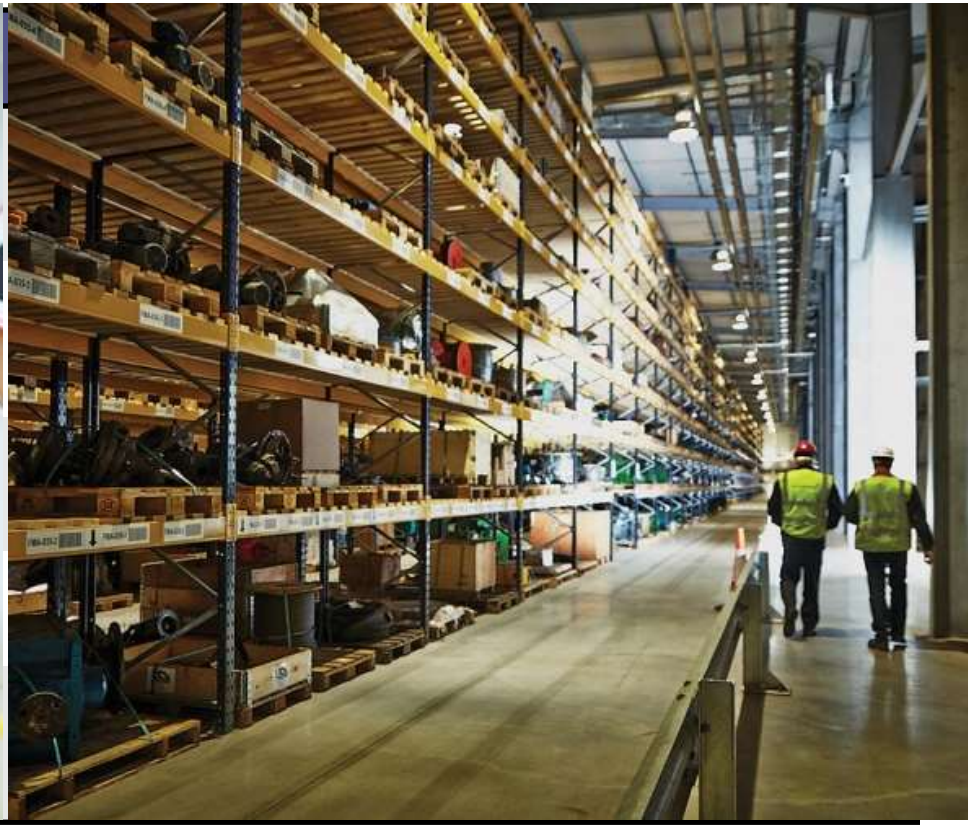
Greenhouse Gas Metrics

- National Inventory
- USDA performance metrics
- USDA entity-scale methods

The National GHG Inventory

- EPA compiles report annually
- Reporting requirements dictated by United Nations Framework Convention on Climate Change (UNFCCC) for Annex 1 countries
- Methodological guidance given by IPCC
- Accounts for anthropogenic GHG emissions and removals for CO_2, CH_4, N_2O, HFCs, PFCs, SF_6, NF_3

Different ways of counting for different goals



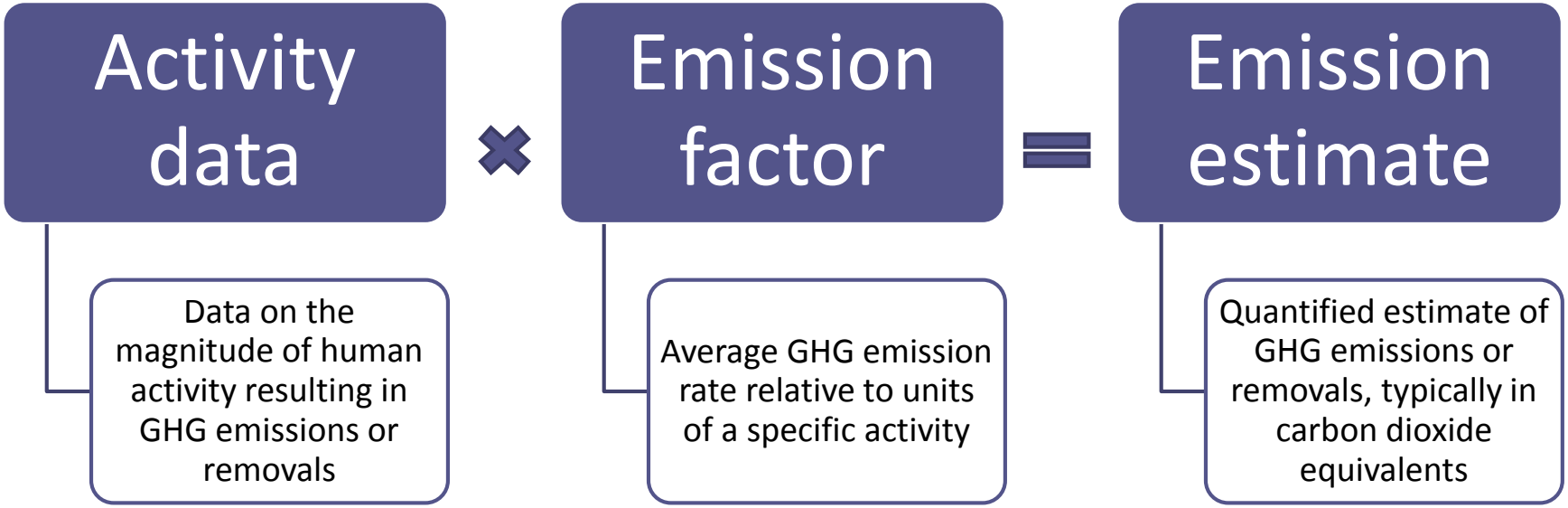
Different ways of counting for different goals

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

Sectors

- Covers five sectors:
  - Energy
  - Industrial Processes and Product Use
  - Waste
  - Agriculture
    - [emission sources only]
  - Land Use, Land-Use Change and Forestry (LULUCF)
    - [carbon stock and stock changes]
- Agriculture, forestry, and other land use referred to as AFOLU
  - Tom Wirth of USEPA is the AFOLU inventory coordinator

Basic inventory method

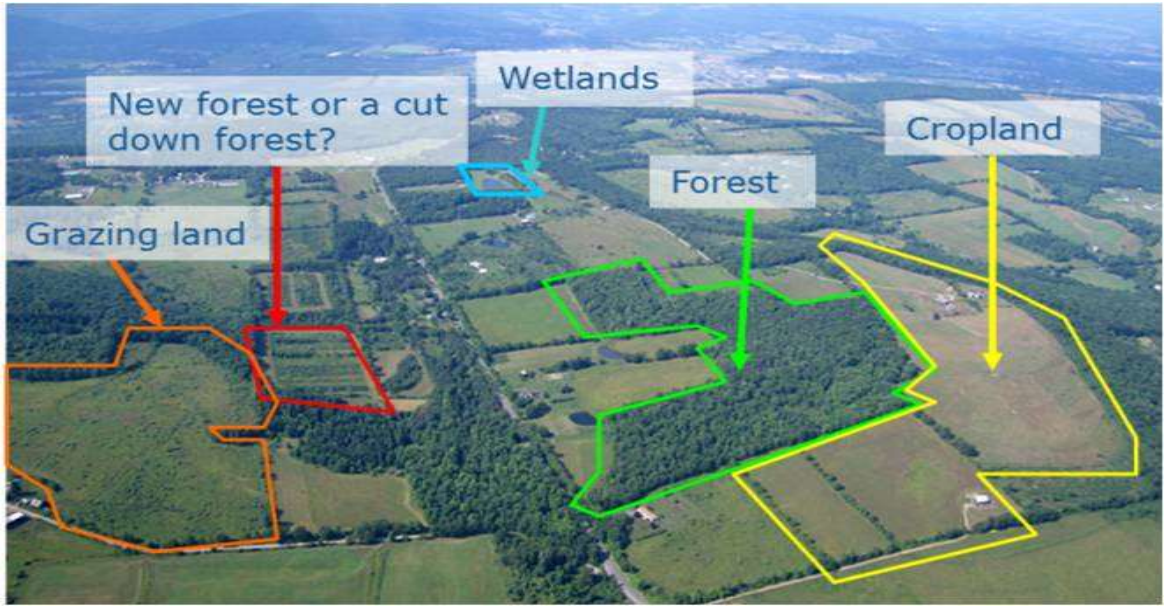


AFOLU processes captured by inventory

- Agriculture
  - Enteric fermentation (CH_4)
  - Manure mgmt. (CH_4 and N_2O)
  - Fertilizers and manure applied to soils(N_2O)
  - Lime and urea applied to soils (CO_2)
  - Rice (CH_4)
  - Field burning of agricultural residues (CH_4 and N_2O)
- LULUCF
  - Above/below-ground biomass
  - Dead wood and litter
  - Soil organic matter
  - Non-CO_2 emissions from land use/land use change

LULUCF land representation

- Separate into managed and unmanaged
- 6 categories
  - Cropland
  - Forest land
  - Grassland
  - Settlements
  - Wetlands
  - Other land
- Identify land use conversions in last 20 years



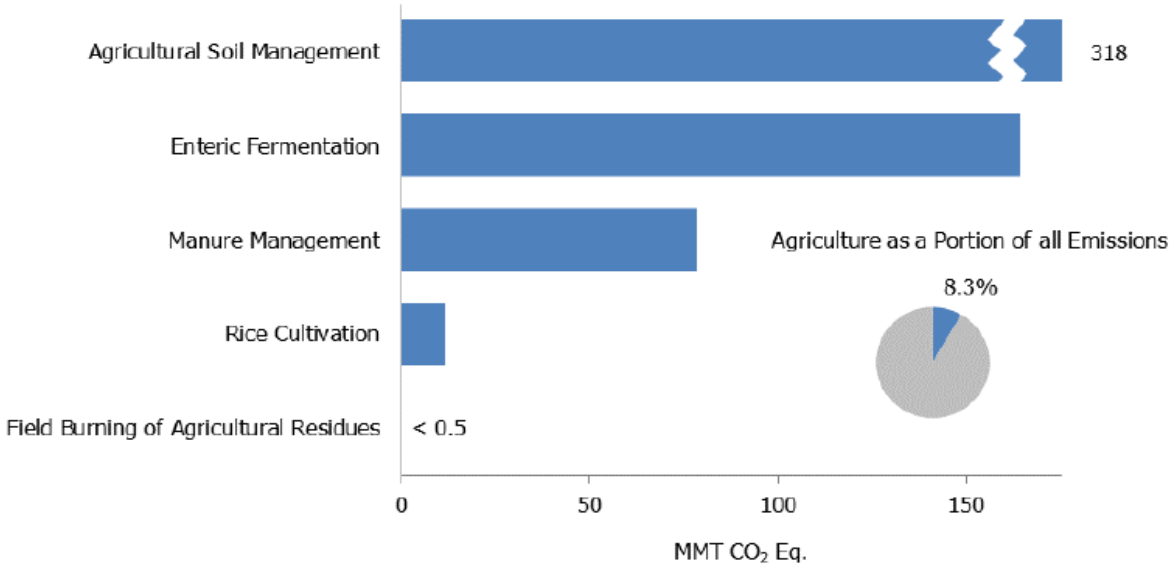
Source: http://forest.jrc.ec.europa.eu/activities/lulucf/

Data Collection and Analysis

- Sources of AFOLU activity data:
  - Census of Agriculture
  - CTIC (Conservation Technology Information Center) surveys
  - FIA (Forest Inventory and Analysis– USDA Forest Service)
  - MODIS (Moderate Resolution Imaging Spectroradiometer– NASA)
  - NLCD (National Land Cover Database)
  - NRI (National Resource Inventory– USDA NRCS)
  - USDA APHIS
  - USDA NASS
  - USDA NRCS Agricultural Waste Mgmt. Handbook
- Data are compiled and stored in a custom database

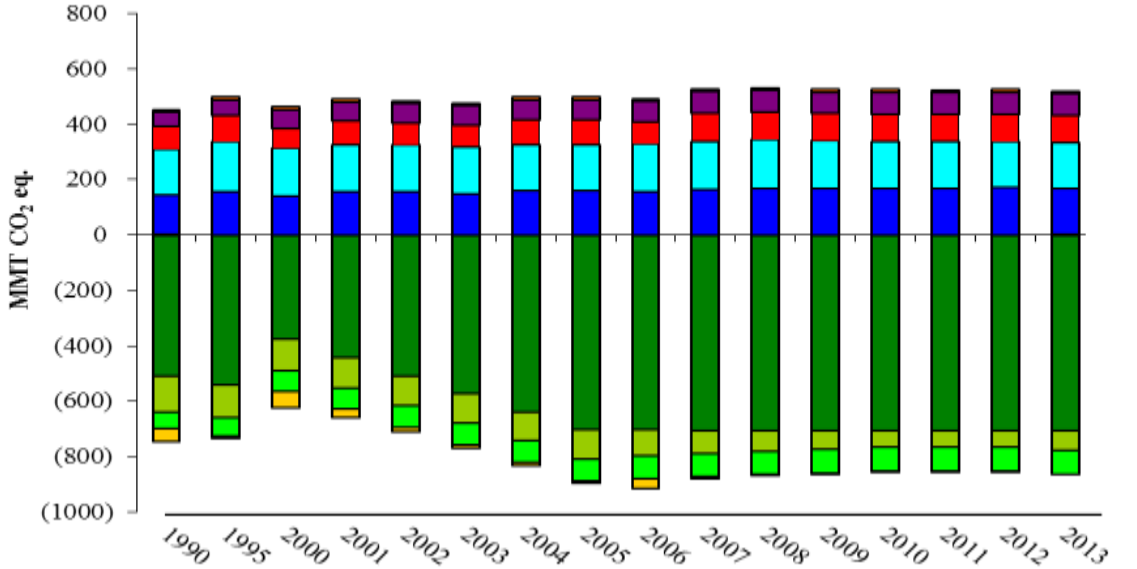
Breakdown of Ag GHG emissions

Figure 5-1: 2014 Agriculture Chapter Greenhouse Gas Emission Sources (MMT CO_2 Eq.)



Land sector emissions and offsets

Figure 1-3
Agriculture and Forestry Emissions and Offsets for 1990, 1995, 2000-2013



Sources	GHG
Rice/Residue Burning	(CH_4, N_2O)
Managed Waste	(N_2O, CH_4)
Grazed Lands	(CH_4, N_2O)
Enteric Fermentation	(CH_4)
Cropland Soils	(N_2O)
Sinks	**GHG**
Agricultural Soils	(CO_2)
Urban Trees	(CO_2)
Harvested Wood	(CO_2)
Forests	(CO_2)

USDA Performance Metrics

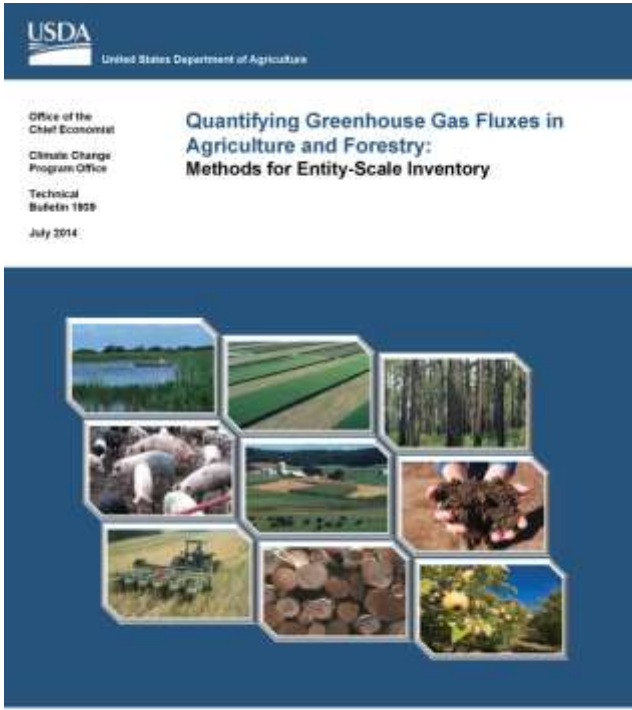
- Based on agency program data
  - E.g. acres converted, digesters installed
- Converted into GHG estimates
- Major challenges

USDA site-specific 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



USDA site-specific tools

Thank you

- Special thanks to Joel Larson and Jan Lewandrowski of USDA