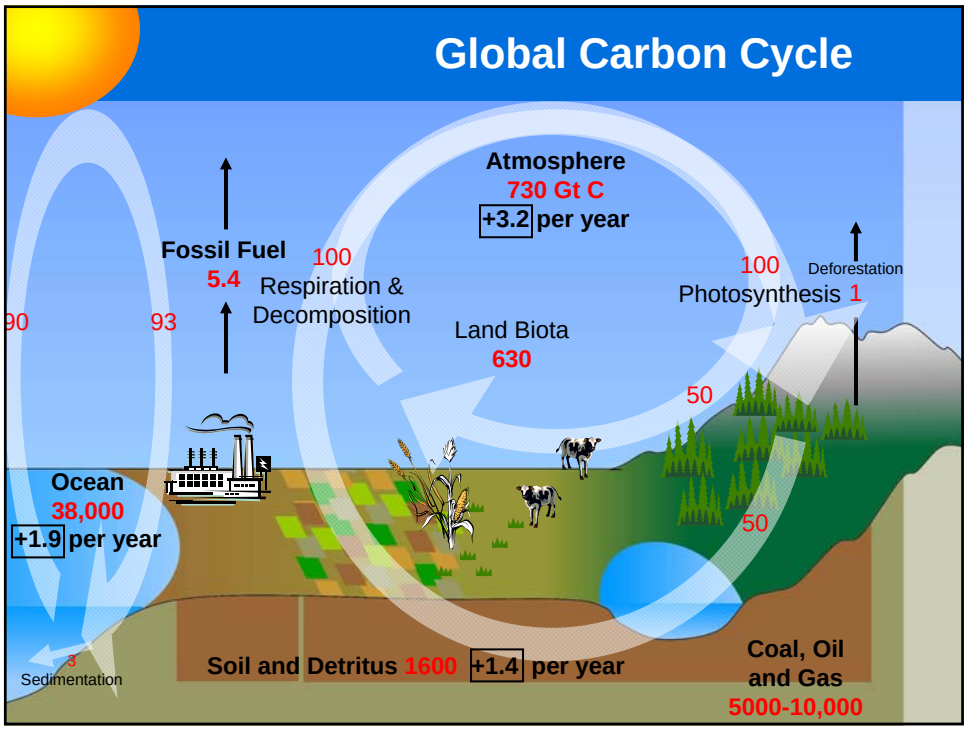
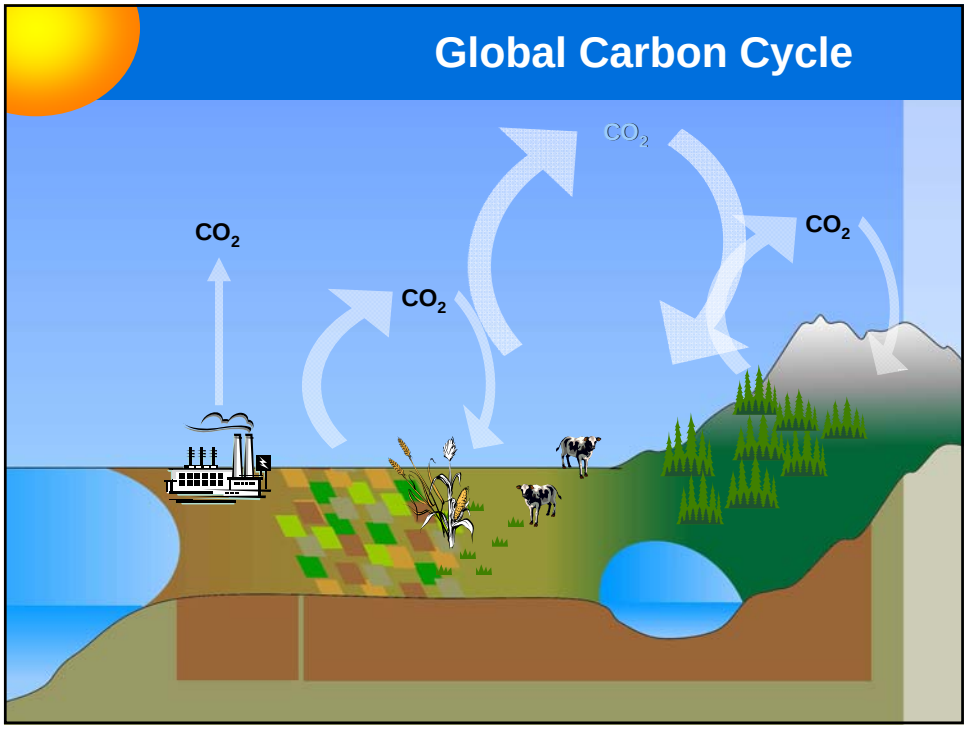
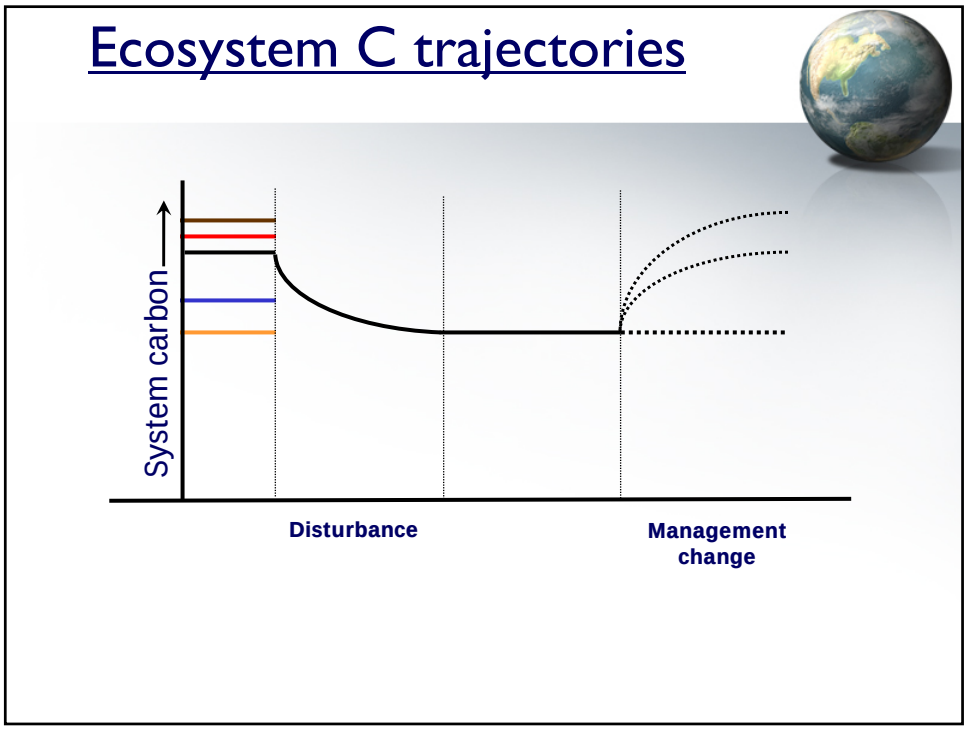
Greenhouse gases and agriculture in Colorado: Emissions and opportunities

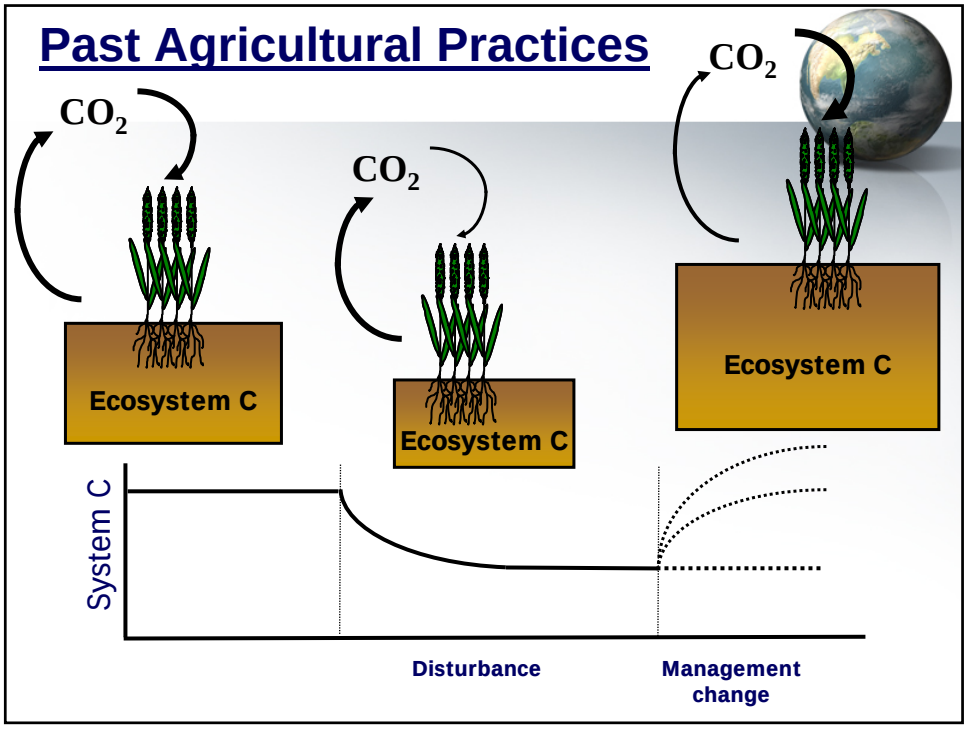
Richard T. Conant

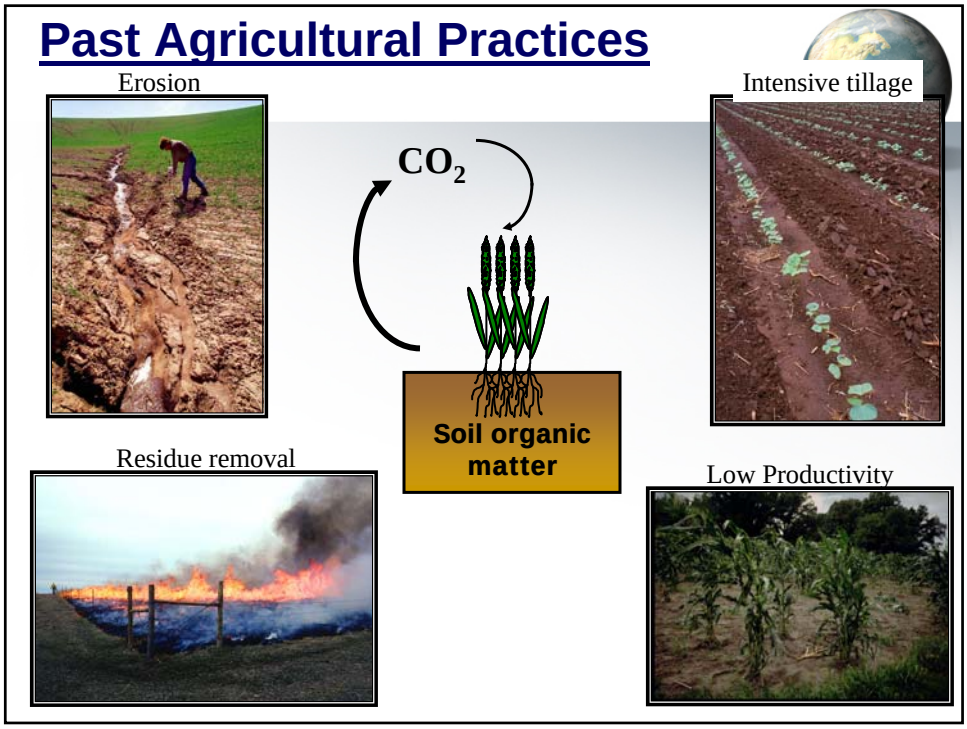
Natural Resource Ecology Laboratory
Colorado State University

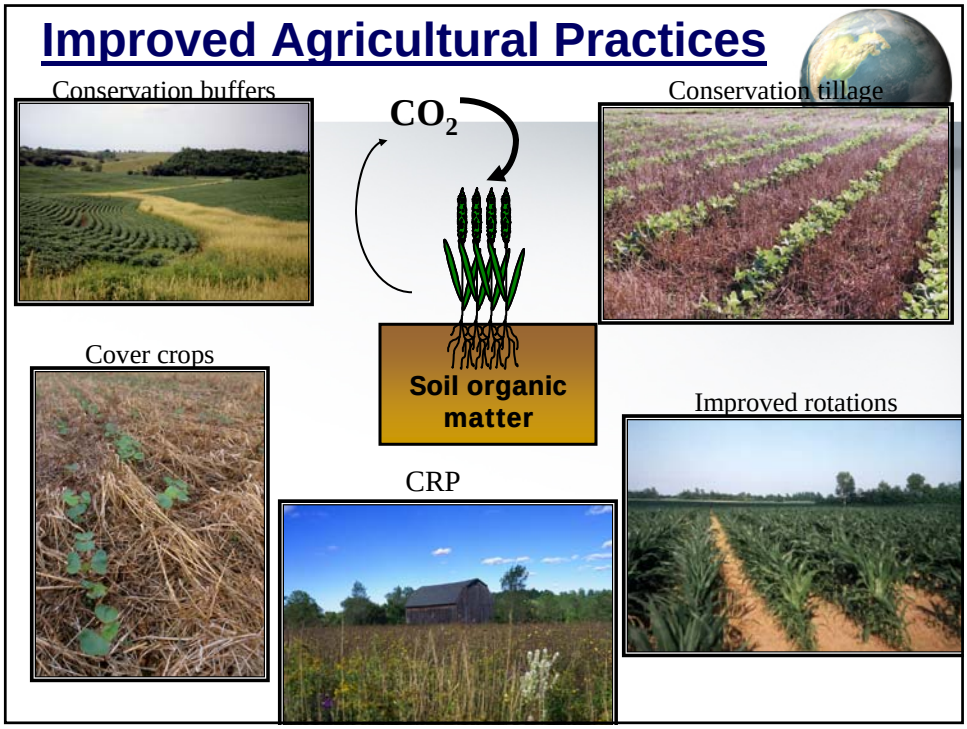


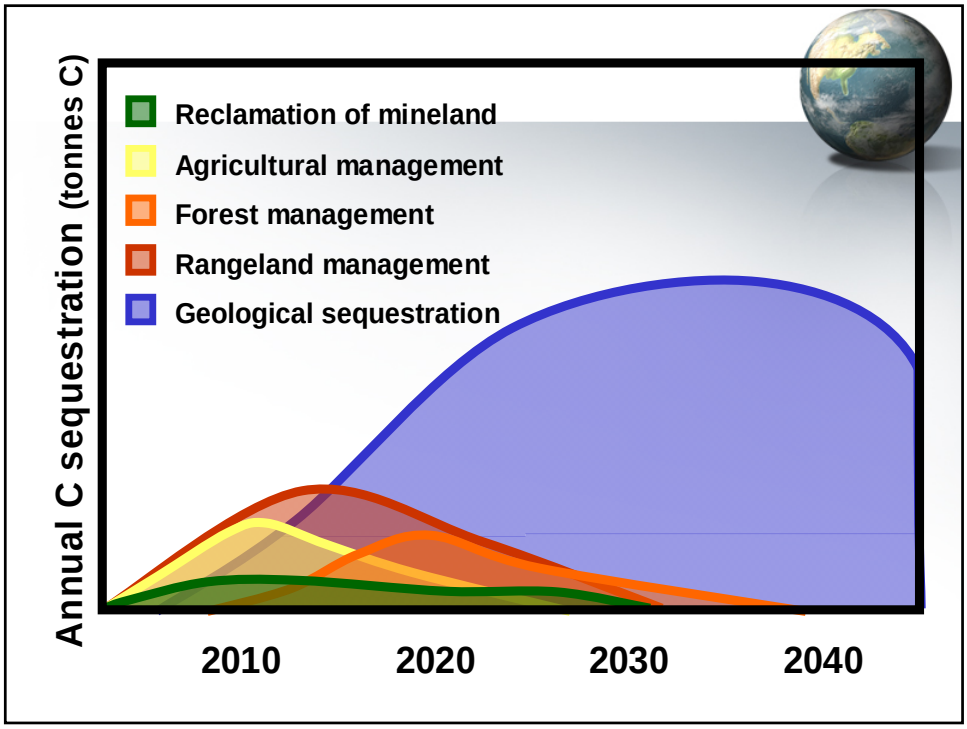

Global Carbon Cycle
CO_2
CO_2
CO_2
CO_2


Ecosystem C trajectories
System carbon
Disturbance
Management change

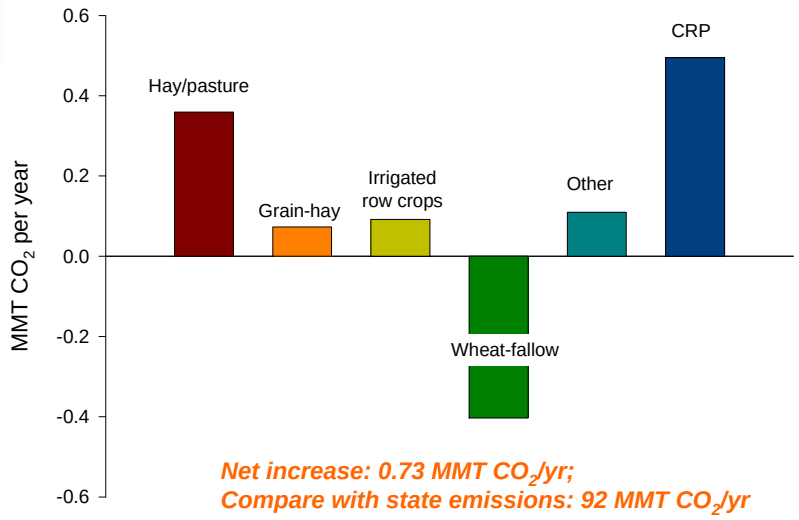

Past Agricultural Practices
CO_2
CO_2
CO_2
Ecosystem C
Ecosystem C
Ecosystem C
System C
Disturbance
Management change


Past Agricultural Practices
Erosion
Intensive tillage
CO_2
Soil organic matter
Residue removal
Low Productivity


Improved Agricultural Practices
Conservation buffers
CO_2
Conservation tillage
Cover crops
Soil organic matter
Improved rotations
CRP


Annual C sequestration (tonnes C)
Reclamation of mineland
Agricultural management
Forest management
Rangeland management
Geological sequestration
2010
2020
2030
2040

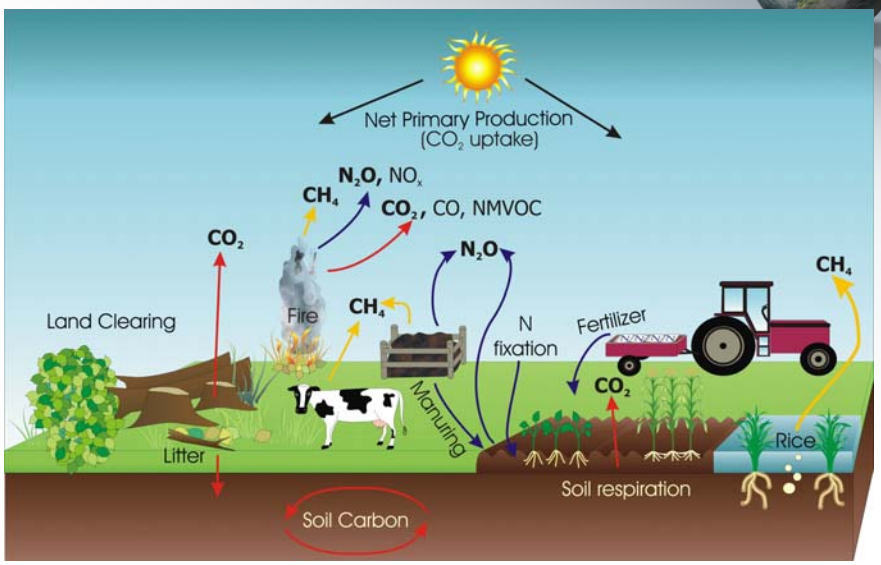
Soil C changes in Colorado cropland (1990-2000)



Net increase: 0.73 MMT CO_2/yr;
Compare with state emissions: 92 MMT CO_2/yr

Source: US GHG inventory (EPA 2006)

Agricultural sources and sinks of greenhouse gases



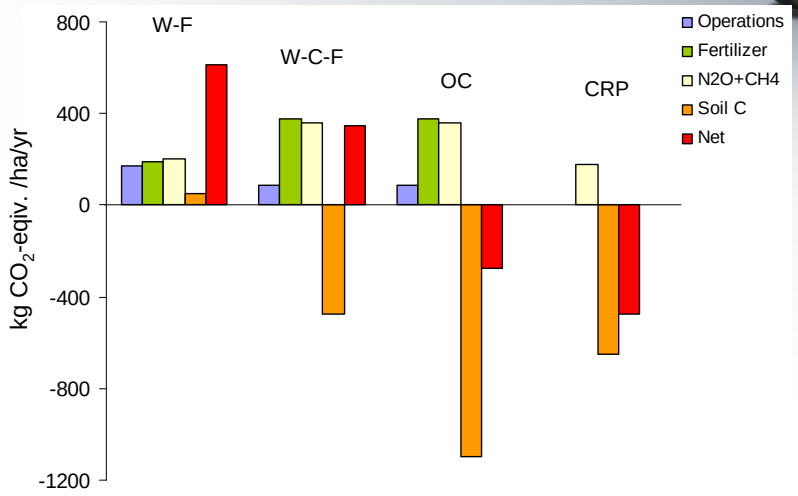
Source: IPCC 2007

No-tillage and crop rotation intensification

~~Conventional wheat-fallow~~

NT Wheat-corn-millet-fallow

GHG balance for dryland crop systems



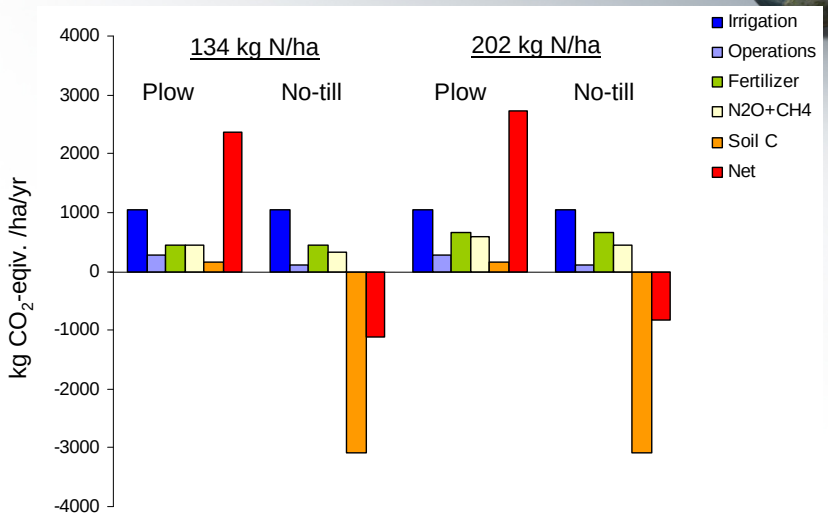
Source: Mosier et al. 2005 + Other literature for W-F

Tillage management on irrigated cropland

~~Intensive tillage~~

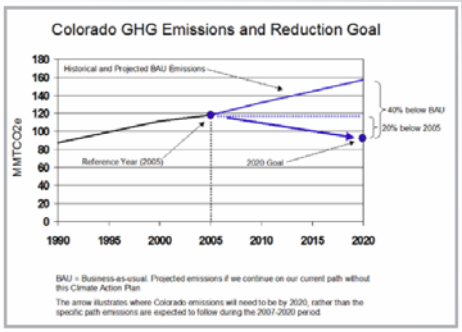
No-till

GHG balance for irrigated continuous corn



Source: Mosier et al. 2005

CO Climate Action Plan: Goal



2005:	120 MMT CO_2e/yr
2020 BAU:	158 MMT CO_2e/yr
2020 Goal:	94 MMT CO_2e/yr
Required cut:	**-64 MMT CO_2e/yr**

Current ag: -0.73 MMT CO_2e/yr

Potential C sequestration:
Dryland BMP: -2.7 MMT CO_2e/yr
Irrigated BMP: -2.6 MMT CO_2e/yr
Rangeland BMP: -5.5 MMT CO_2e/yr

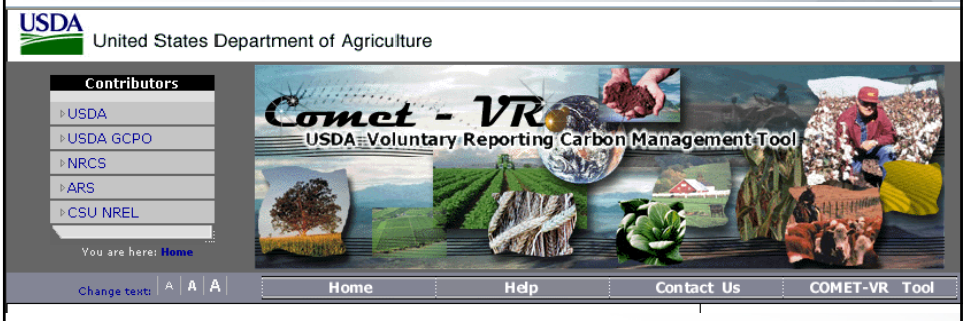
Potential CH_4 from 20% emission cuts:
Enteric/ruminant: -0.6 MMT CO_2e/yr
Manure mgmt.: -0.1 MMT CO_2e/yr

Potential N_2O from 40% emission cuts:
Manure mgmt.: -0.4 MMT CO_2e/yr
Fertilizer mgmt.: ??

Potential reduced fuel use, offsets:
??

Potential ag: -9.9+ MMT CO2e/yr

COMET-VR (CarbOn Management and Evaluation Tool – Voluntary Reporting)



- Currently supports soil C change estimates and fuel usage
- N_2O emissions will be incorporated in the next version
- New Colorado version under development!

Conclusions

1) Agriculture is a significant emitter of GHGs

2) CO agriculture can play a major role in mitigation – reducing/offsetting CO emissions by 15% or more

3) Methods and tools exist to quantify GHG emission reductions and soil C sequestration.