Land use and Greenhouse gas emissions



Total Annual Anthropogenic GHG Emissions by Groups of Gases 1970–2010

Key points:

- Most current Ag emissions are as methane and nitrous oxide, not CO₂
- Historically (last 10K yrs) LU conversion has been a huge source ca. 500 billion tonnes CO₂ from soils
- Recovering a significant fraction of that 'lost sink' could aid in needed 'CO₂ drawdown'
- Needs to be accompanied with major non-CO₂ emission reduction from ag sources

Practices and technologies for sequestering soil C

- Existing 'best management practices' (BMPs)
 - Conventional conservation practices that can be more widely adopted

Frontier technologies

- Practices in early stage of development
- Practices with significant technical or economic constraints to widespread adoption

"Conventional" technologies

Improved annual crop rotations



Improved pastures & grazing



Restored grassland

Restored peatlands





Agroforestry



"Frontier" technologies

Enhanced root phenotypes



Perennial grains



Biochar/organic waste amendments





Estimates of global 'technical' potentials for atmosphere CO₂ removal to soils



National Academy of Science report (2019)

Incentivizing mitigation activities

Government programs
e.g. USDA Climate Building Blocks



Market-based incentives (C offsets)



 Demand-side incentives (supply chain management)



Global Soil Information, Measurement and Monitoring



COMET-Farm & COMET-Planner – Farm-scale GHG inventory tools



Applications:

USDA Conservation programs State Healthy Soils programs Carbon markets: NORI, CAR Companies: e.g. Ben & Jerry's, Northface, Annies

