



INTER-AMERICAN INSTITUTE FOR GLOBAL CHANGE RESEARCH

## IPCC WG2 – Future Research Needs

fossil fuel substitution by agriculture & forestry

climate change mitigation through biomass potentials

: costs and trade-offs with soil conservation

balancing carbon needs for soils and energy consumption



## **crop residue**

decreased maximum soil temperatures at the soil surface by at least 5°C

increased soil water storage by at least 50 mm

increased uptake of nitrogen from the soil organic matter and applied fertilizers

Power, Wilhelm, Doran, Soil Tillage Res., 8: 101-111





each  $\text{Mg ha}^{-1}$  of maize residues on the soil surface increased maize grain and stover production by approximately  $120$  and  $270 \text{ kg ha}^{-1}$





**typical maize yield: 4-7 Mg ha<sup>-1</sup>**

**typical harvest index: 32 to 46%**

**=**

**typical residue amount**

**0.5 - 1.5 Mg carbon ha<sup>-1</sup>**





carbon fixation 2.5 Mg



carbon harvest 1.0 Mg

carbon residue 1.5 Mg

**Result: 50% soil carbon loss relative to grassland**



carbon fixation 2.5 Mg



carbon fuel harvest 1.5 Mg

carbon grain harvest 1.0 Mg

**Result estimate:**

**70% - 80% soil carbon loss relative to grassland**





## **soil organic matter function**

nutrient supply

water storage

surface protection

carbon storage

## **mitigation cost**

fertilizer

irrigation

erosion

CO<sub>2</sub> mitigation



crop residues are not "free" energy