

Agriculture at the Crossroads: Energy, Farm and Rural Policy

1 Mar., 2007 Arlington, VA

Increasing Carbon Sequestration by Reducing Tillage.

by

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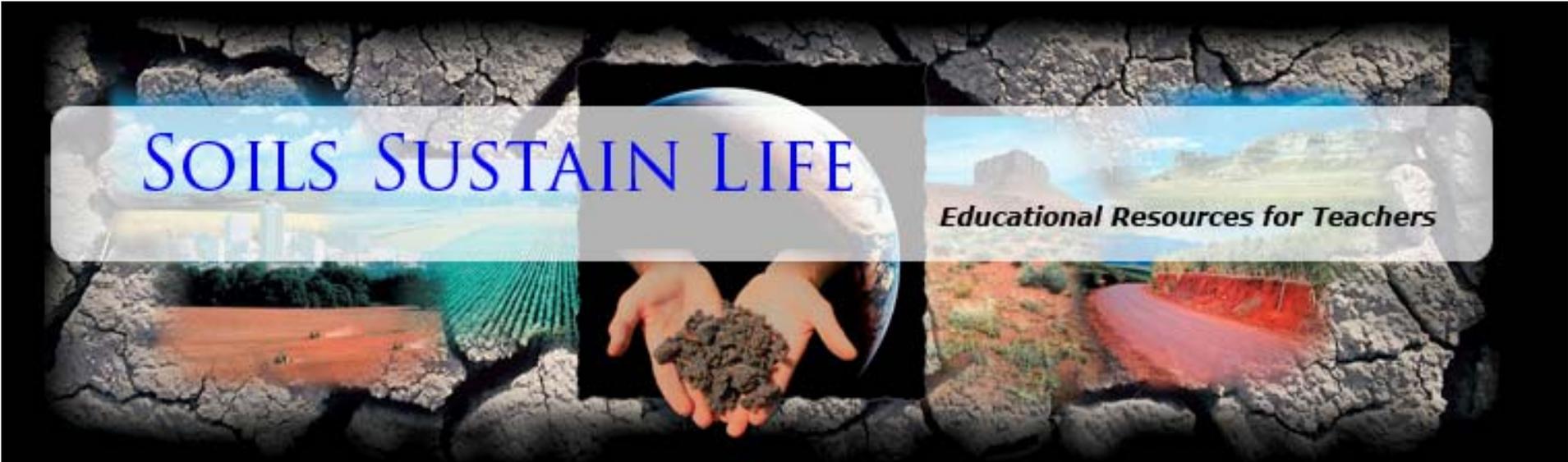
We have only



Earth!

SOILS SUSTAIN LIFE

Educational Resources for Teachers



Soil is the reservoir on which most life on earth depends, as the primary source of food, feed, forage, fiber, and pharmaceuticals.

Soil plays a vital role in sustaining human welfare and assuring future agricultural productivity and environmental stability. The study of soil as a science has provided us with a basic understanding of the physical, chemical, and biological properties and processes essential to such a complex ecosystem.



Source: Soil Science Society of America | 677 South Segoe Road | Madison, WI 53711
608-273-8080 | www.soils.org | headquarters soils.org

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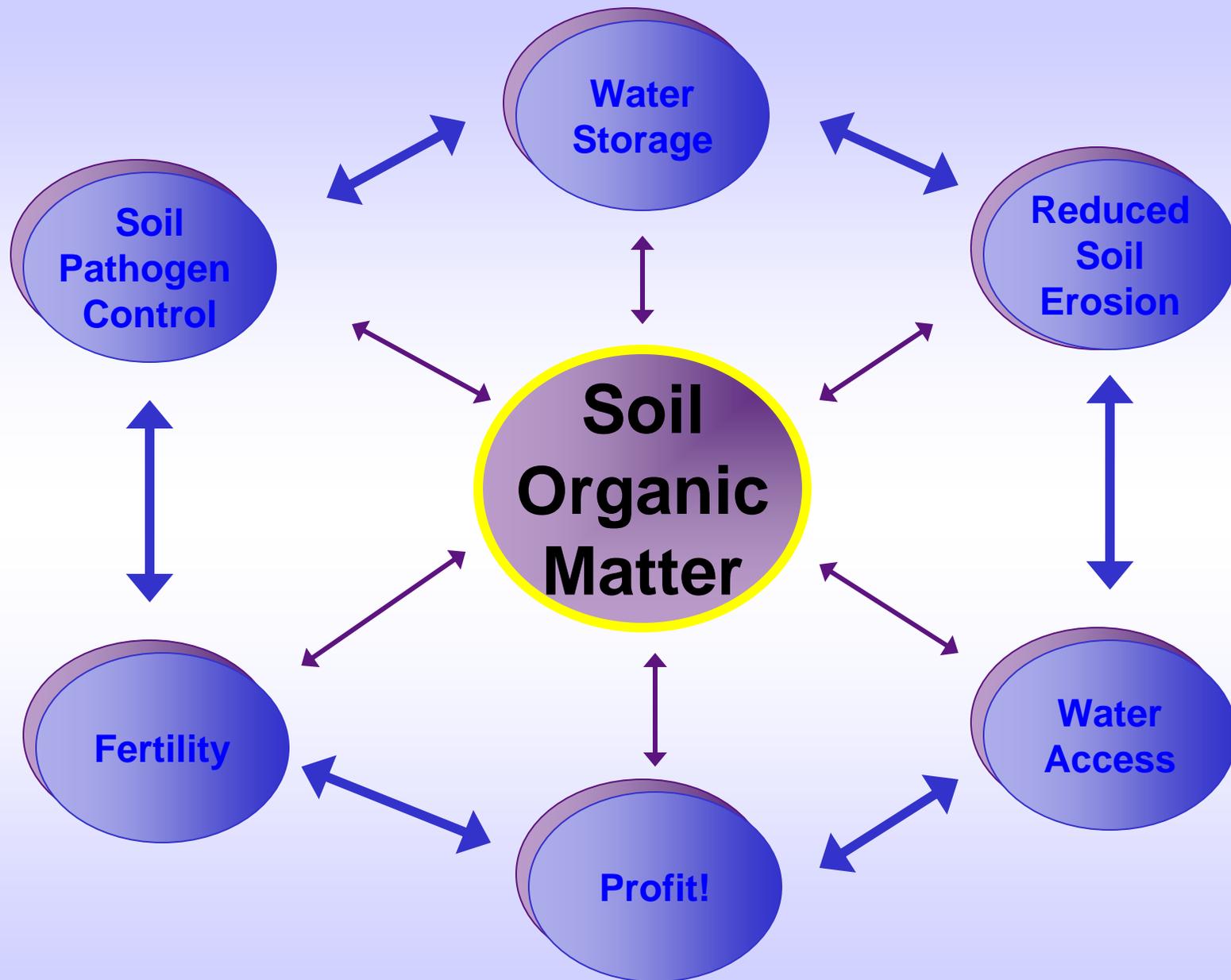
**“Soil organic matter
is the nation’s most
precious resource.”**

**Daniel Albright, 1938, “Soils
and Men”**



Environmental Benefits

- increased water holding capacity and use efficiency
- increased cation exchange capacity
- reduced soil erosion
- improved water quality
- improved infiltration, less runoff
- decreased soil compaction
- improved soil tilth and structure
- reduced air pollution
- reduced fertilizer inputs
- increase soil buffer capacity
- increase biological activity
- increase nutrient cycling and storage
- increased diversity of microflora
- increase adsorption of pesticides
- gives soil aesthetic appeal
- increase capacity to handle manure and other wastes
- more wildlife



True Conservation Agriculture is carbon management.

Conservation agriculture provides beneficial ecosystem services:

- 1. Food and fiber and biofuels**
- 2. Less erosion, less pollution, clean water, fresh air, healthy soil, natural fertility, higher production, carbon credits, beautiful landscape, sustainability etc., etc.**

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Soil carbon is a priceless key to the planet's health and our environmental quality.

M = Mobile

R. = Research

G = Gas

E = Exchange

M = Machine

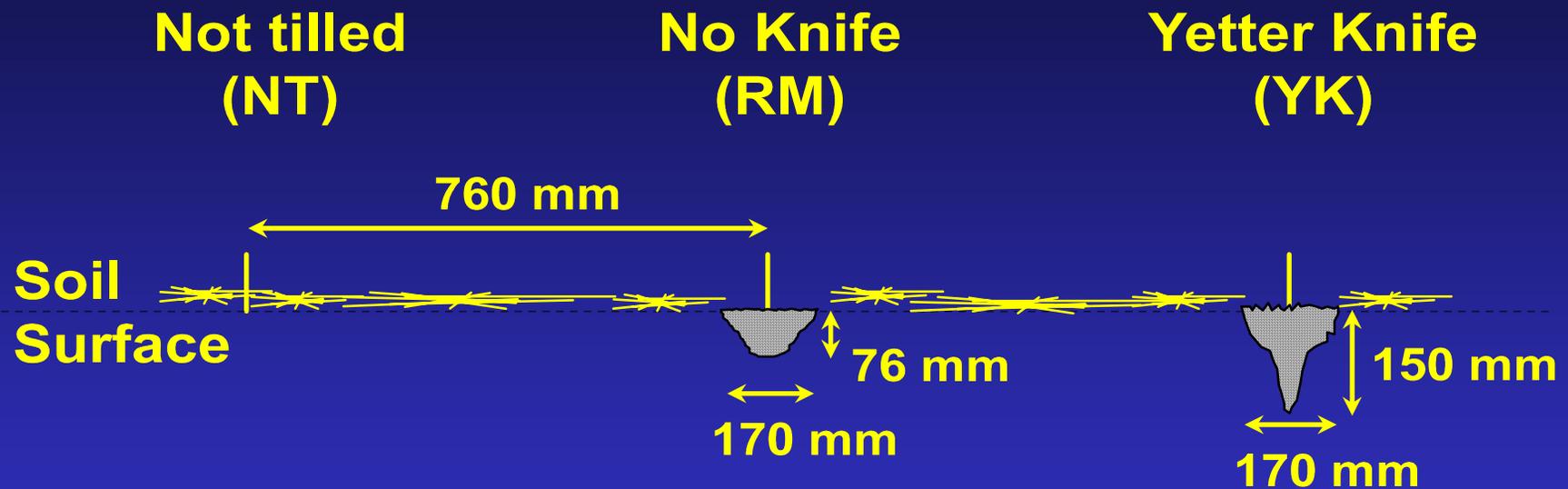
MR. GEM



Invisible effects of invisible forces!

Schematic Representation of Strip Tillage Soil Disturbance

Yetter triple beam tool bar
4 rows at 760 mm spacing



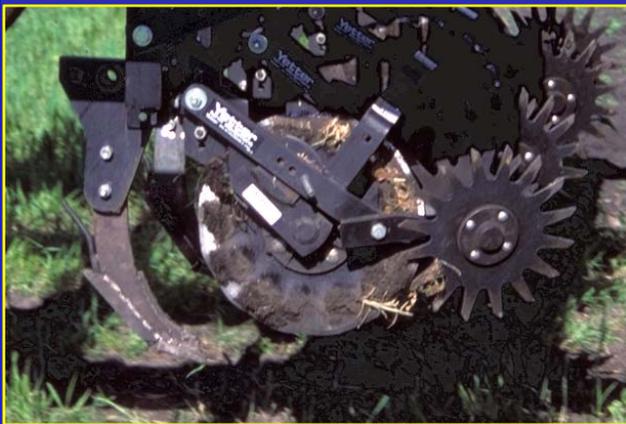
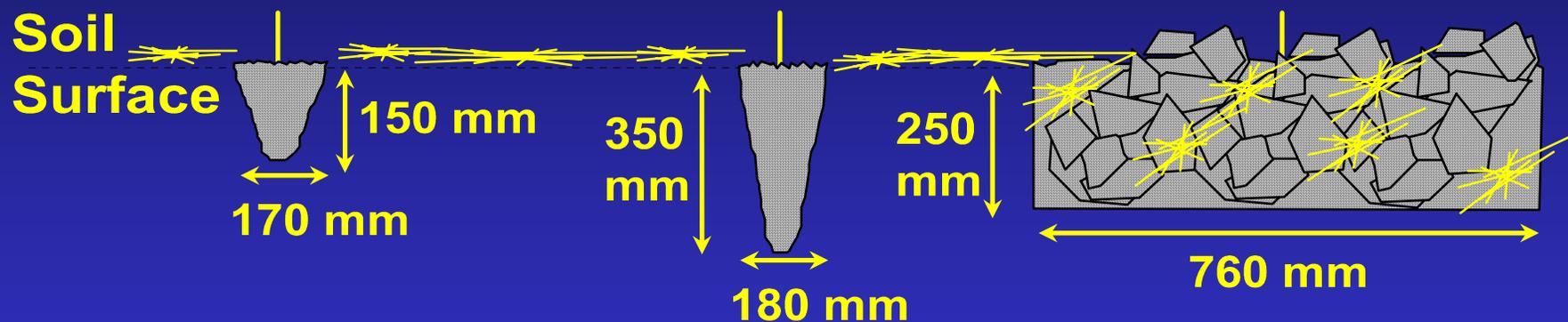
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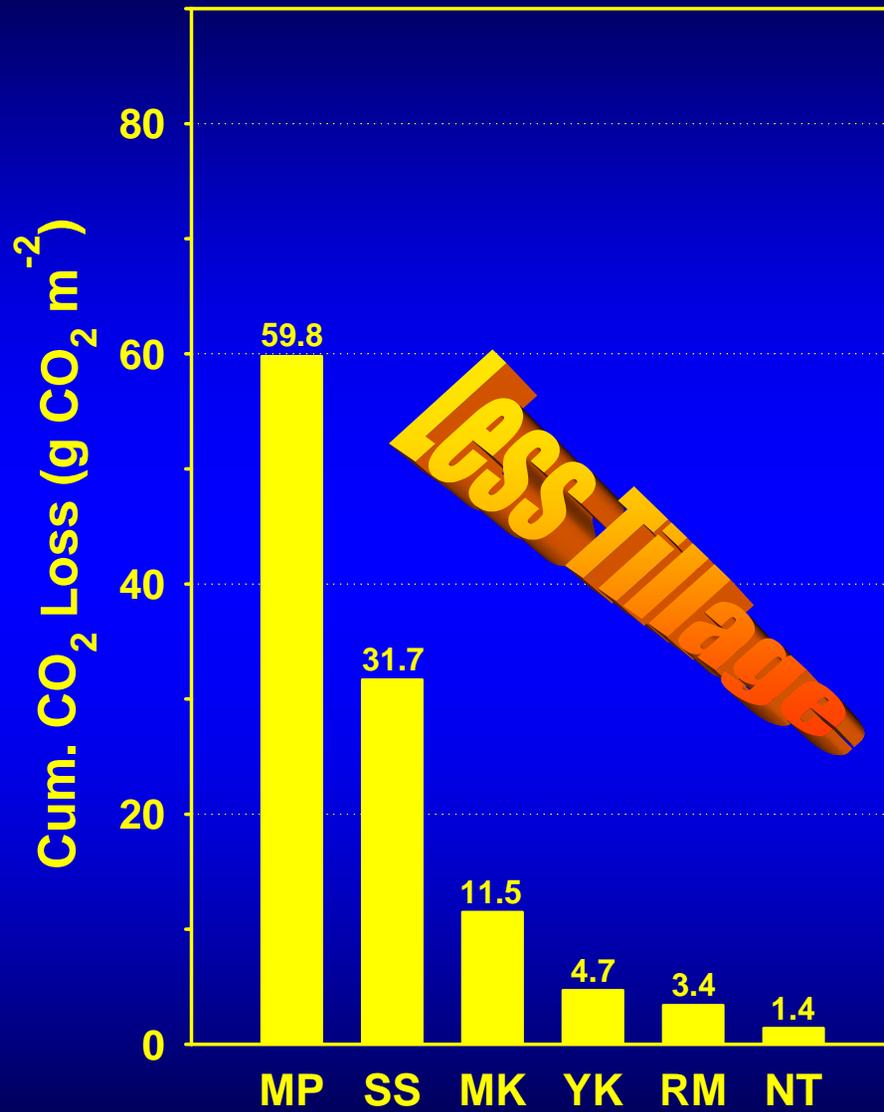
Mole Knife
(MK)

Subsoil Shank
(SS)

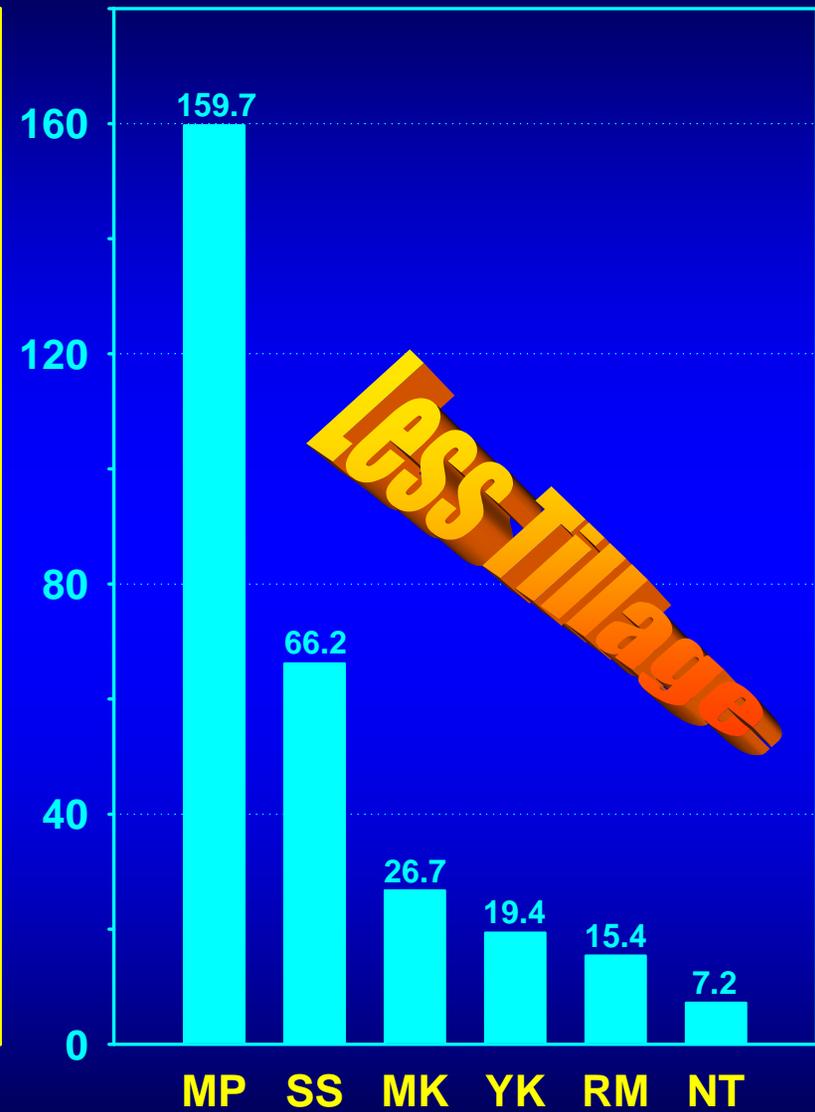
Moldboard
Plow (MP)



5 hours after tillage

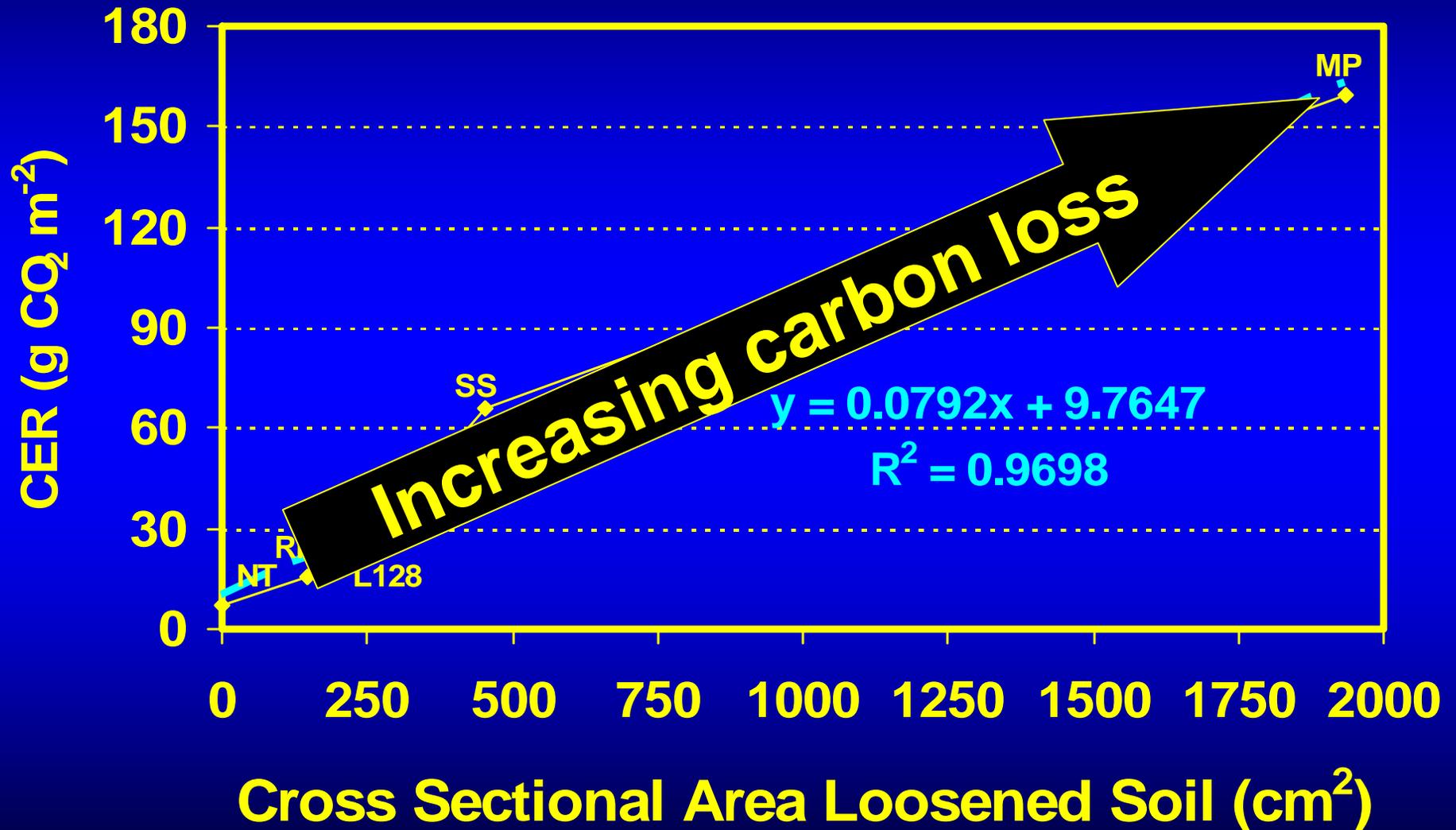


24 hours after tillage



Tillage Type

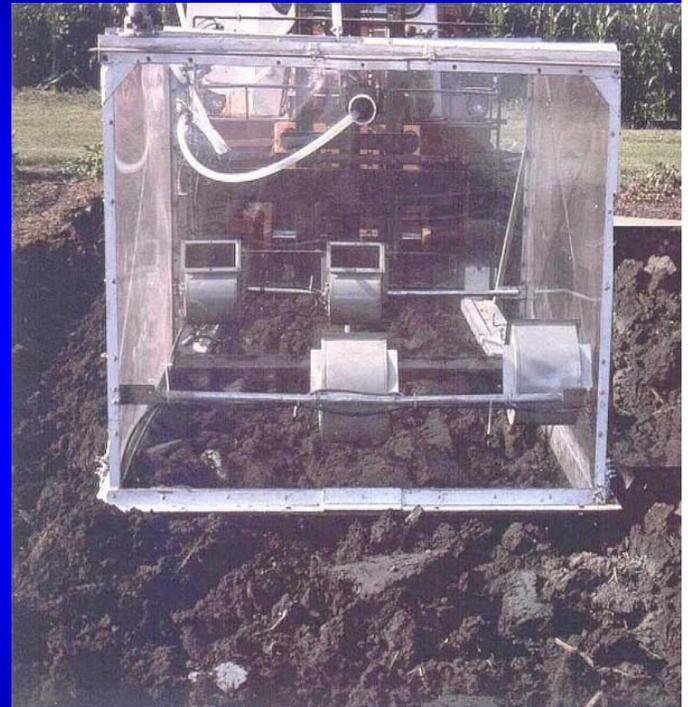
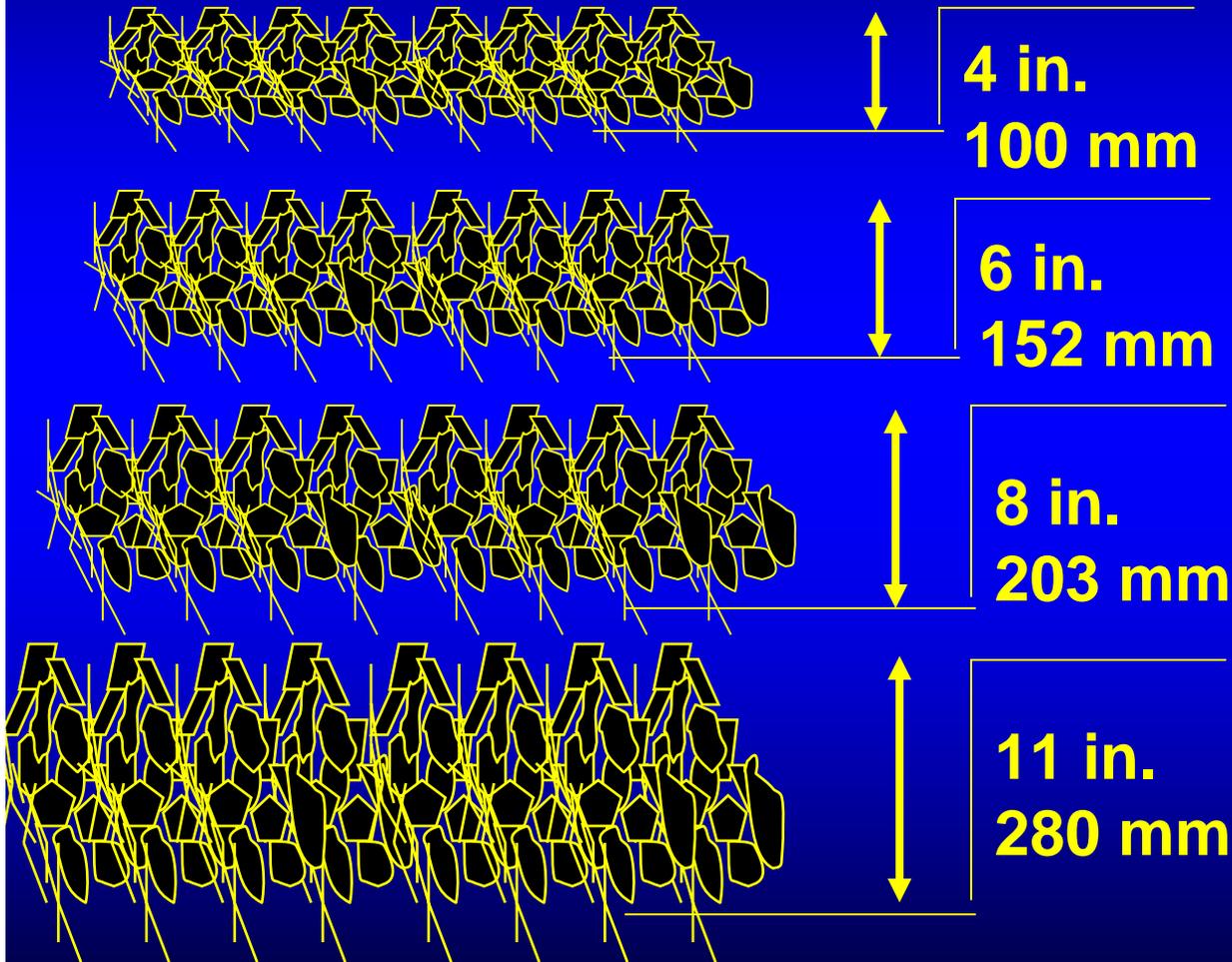
Strip Tillage #1 3 June 1997 Swan Lake
Cumulative Carbon Dioxide Loss after 24 hours



1998 Plow Depth Study Swan Lake Farm

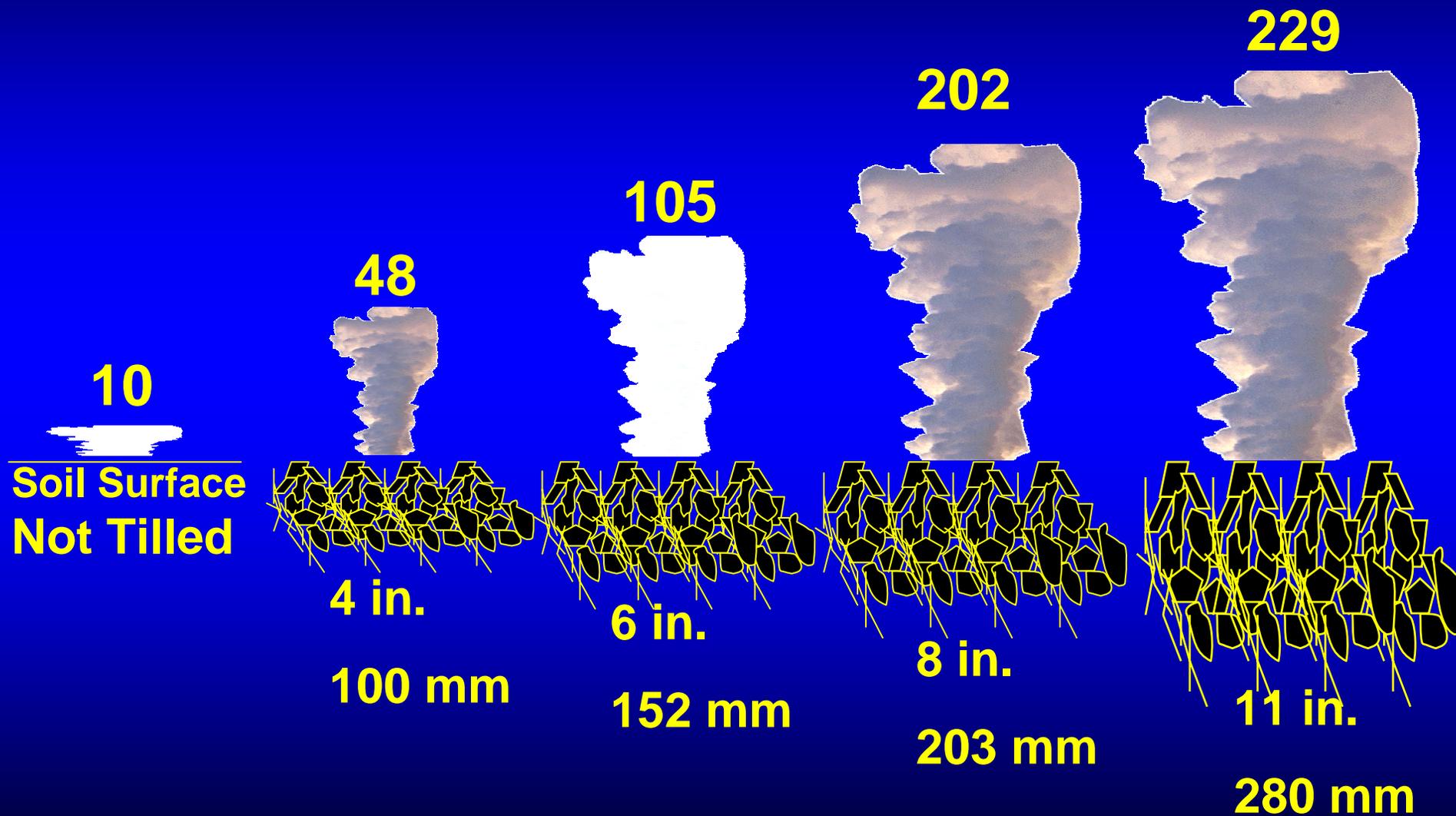
Soil Surface

Not Tilled



12 Aug., 1998 Plow Depth Study Swan Lake Farm

24 hour cumulative CO₂ losses (g CO₂ m⁻²)



Erosion - Erosion - Erosion - Erosion

Water - immediately visible



Wind - immediately visible



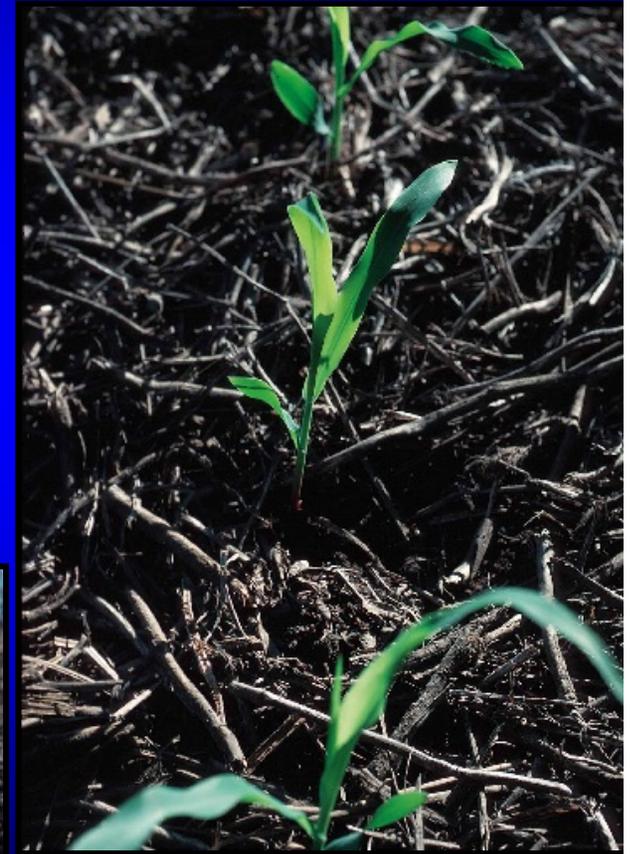
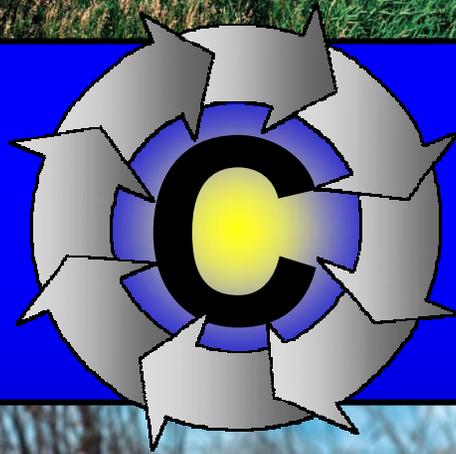
Aerobic - invisible



Tillage - slowly visible



Carbon is the “C” that starts “C”onservation!



**Stop Erosion.
Save Carbon.
Park the Plow!**



SEP 13 2004

Credit: Ken Scott, Clear Lake, IA

The dawning of a new era in agriculture!

**Agriculture has produced food, feed and fiber.
Now agriculture is expected to produce food,
feed, fiber and **biofuel**.**

JAN 19 2007

The Earth's salvation, Biomass for renewable fuel.



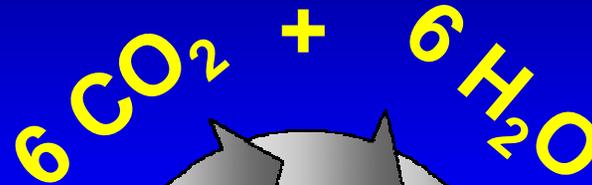
Biofuels can be considered "sun fuels" because they are all derived from the energy captured through photosynthesis.



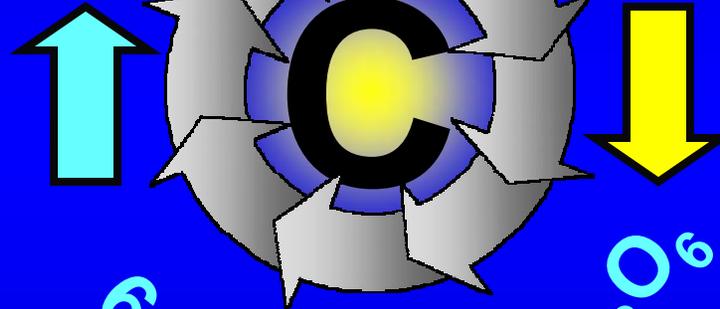
The Carbon Cycle



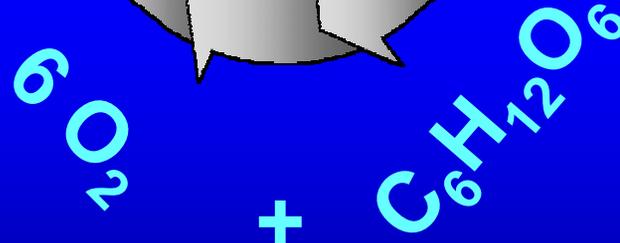
Photosynthesis



Energy Release



Energy Capture



Respiration



The devil is
in the
details!

Beckism #101

Biomass Balancing Act



Soil

How do we
maintain a
sustainable
balance?

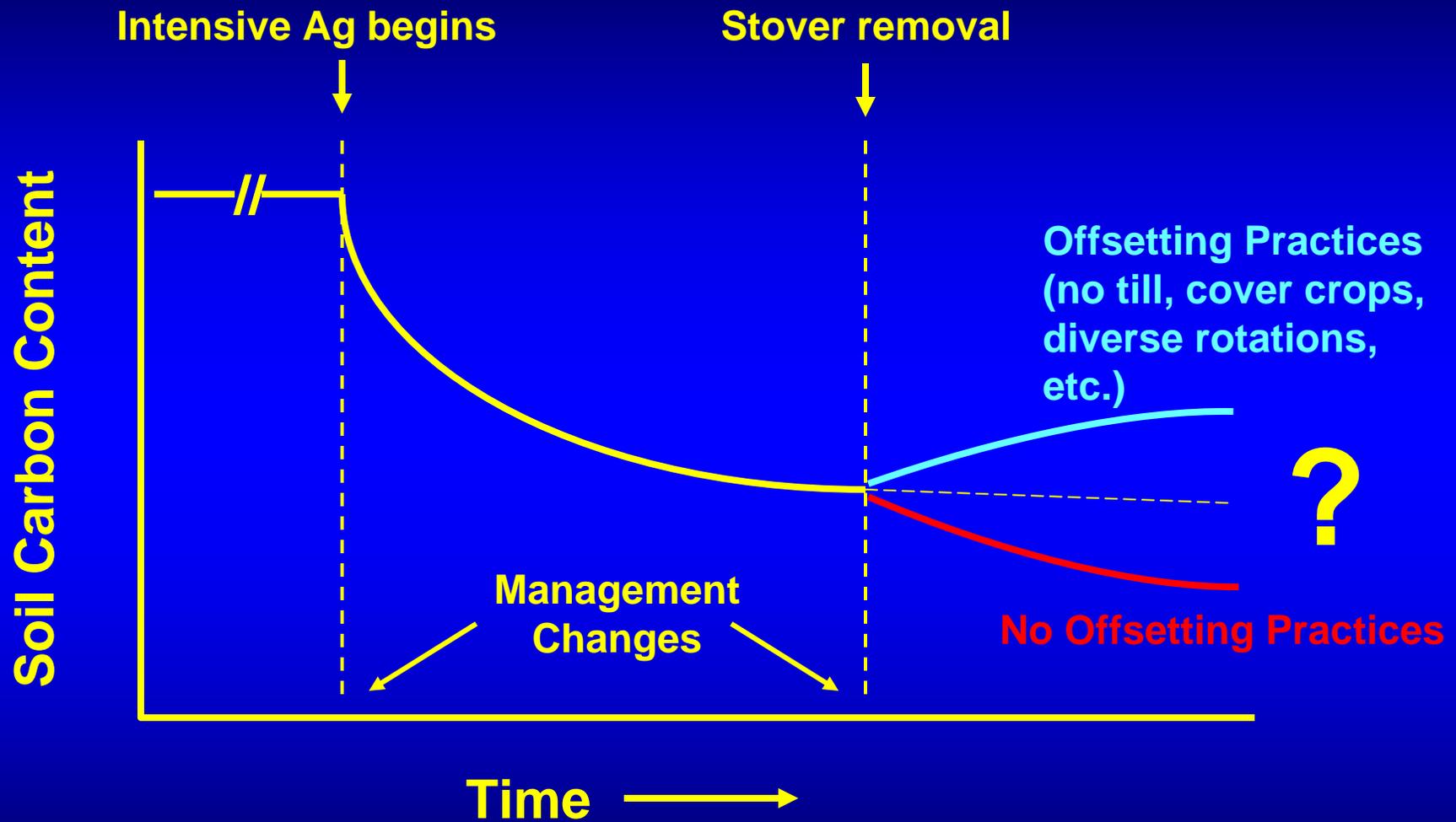


Biofuel



Maintain our sun, soil, water and air resources!

Soil C Change with Management



Soil Conservation - Bio-energy Balance

**Stover
Retention**

**Stover
Removal**

Erosion control
Soil organic matter
Environmental quality

Society's energy needs
Short-term economic return
Long-term social stability

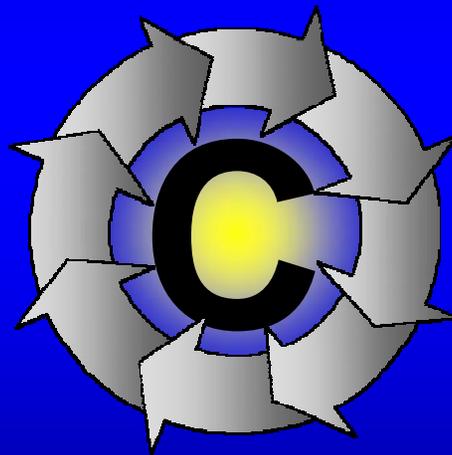
Soil protection

Bio-fuel production

A challenging balancing act!

Conservation is Linked to Bio Energy through Carbon.

Conservation  **Bio Energy**



Carbon Cycle Management

Conservation Agriculture! Carbon Management! Win-Win-Win Strategy!

Win #1

**Growing
food and
fiber to feed
the world.**

Win #2

**Growing
biomass for
renewable
bioenergy.**

Win #3

**Protecting the
environment
and all its
resources.**

A lot of responsibility for farmers!

