

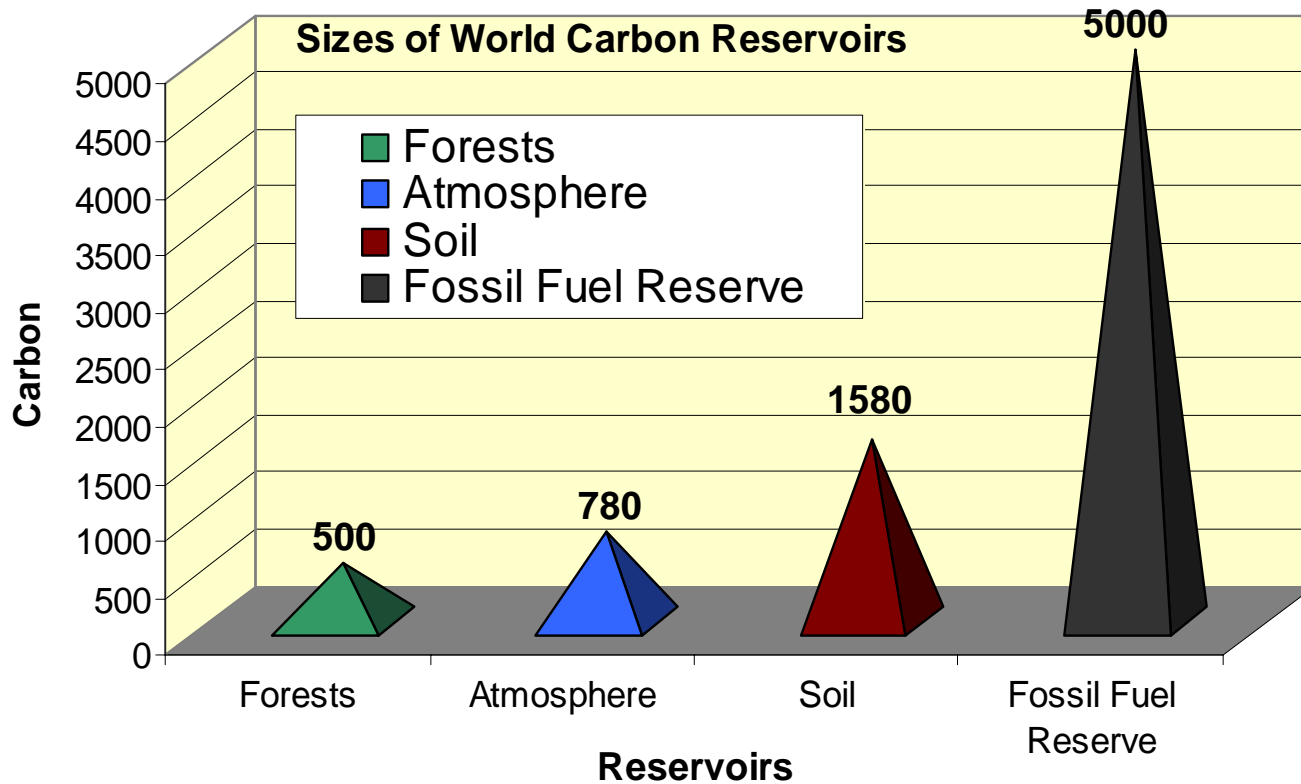
# **Agricultural Opportunities**

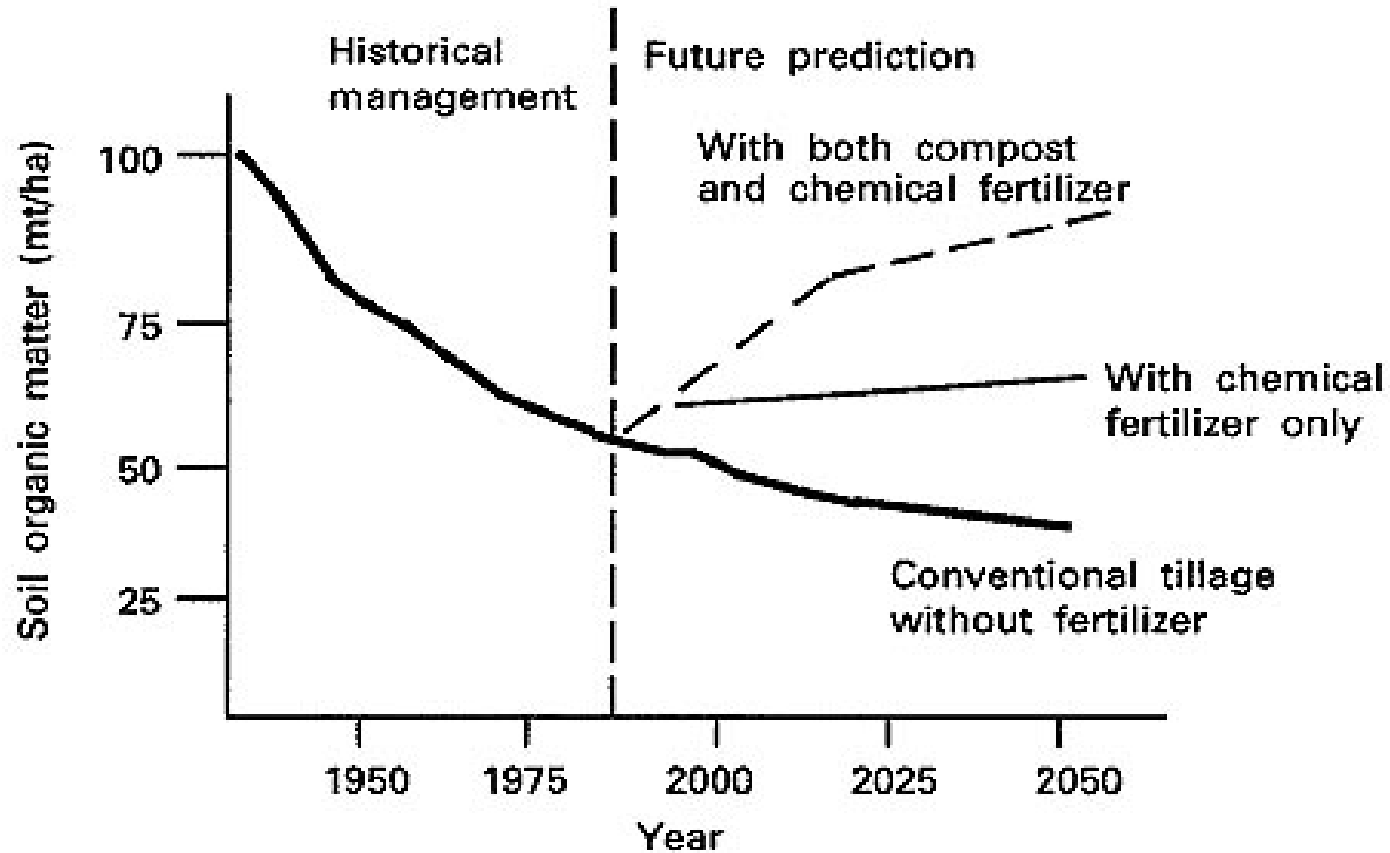
For  
Greenhouse Gas Reduction

# Agricultural Opportunities

1. Improve Energy used to conduct
2. Sequester Greenhouse Gases in Soil
3. Produce Renewal Fuel

# Where is the Carbon coming?

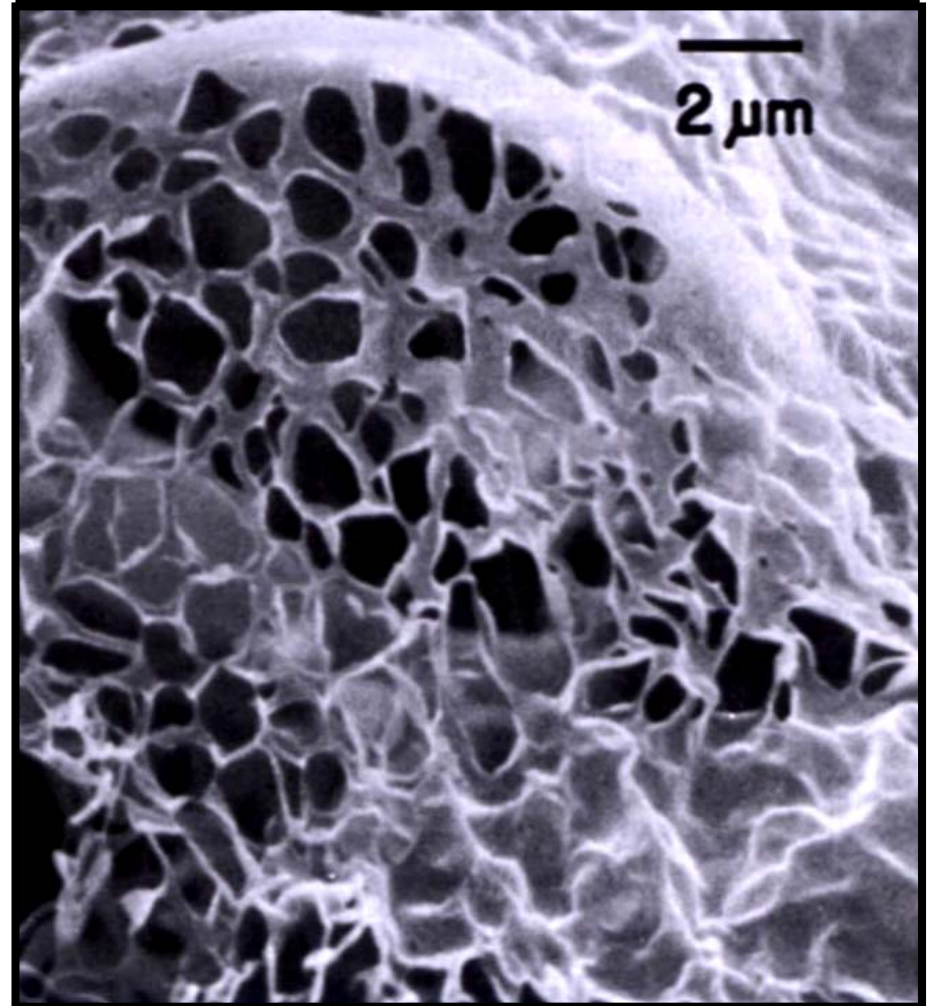




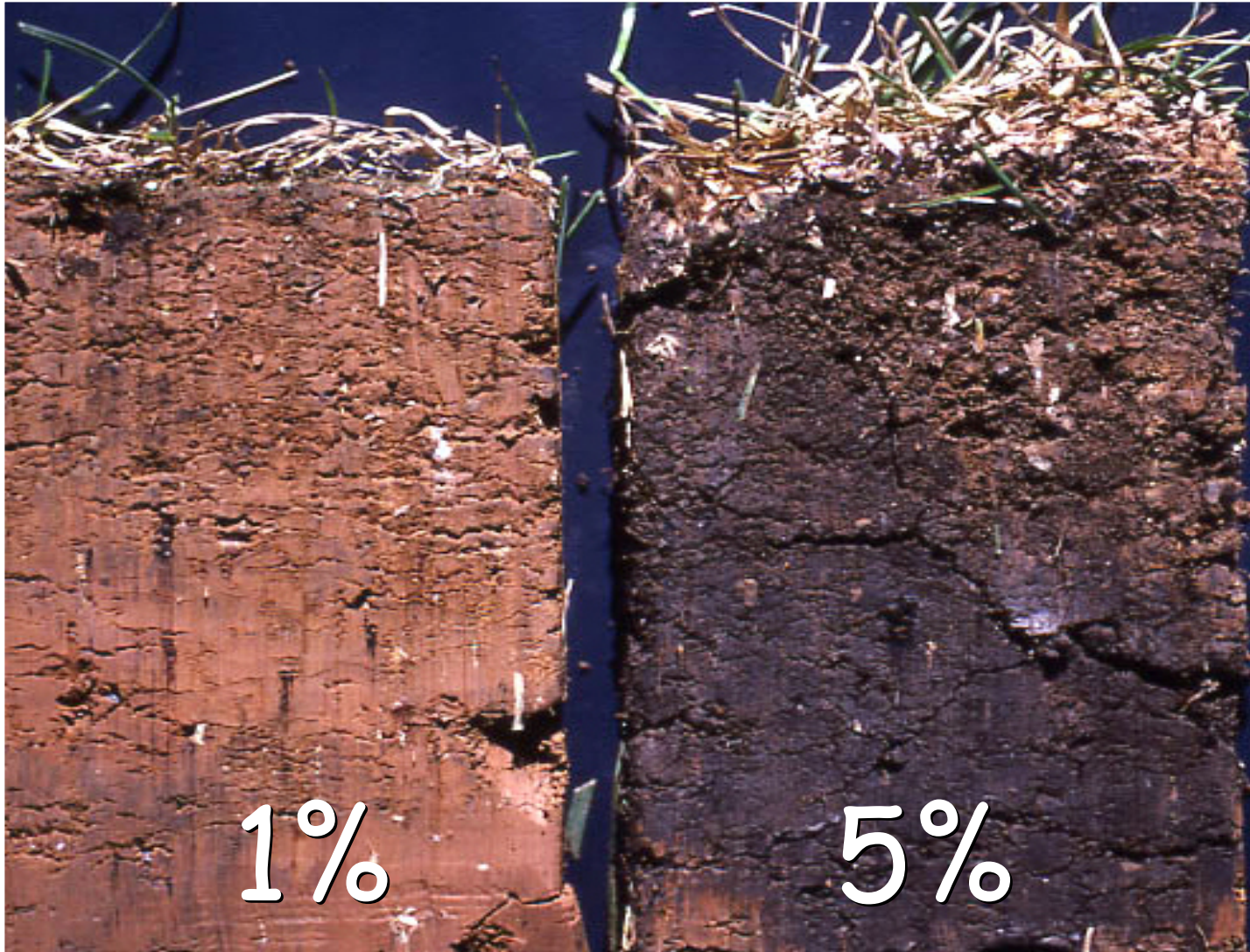
# Soil organic matter

- Holds water
- Cements soil particles
- Reduces acid soil toxicity through natural liming
- Increases micronutrient availability

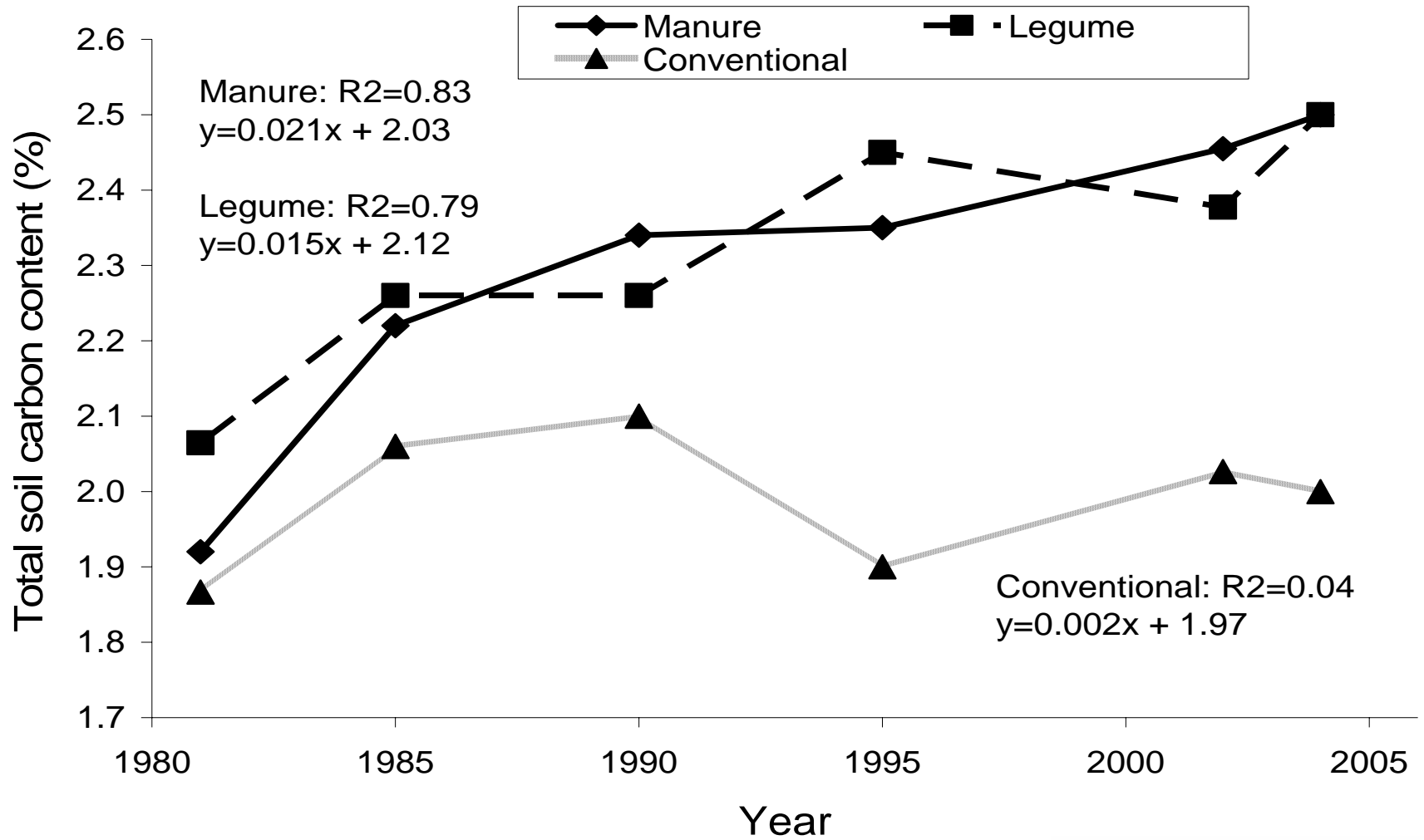
Electron micrograph of  
soil humus



# Soil organic matters



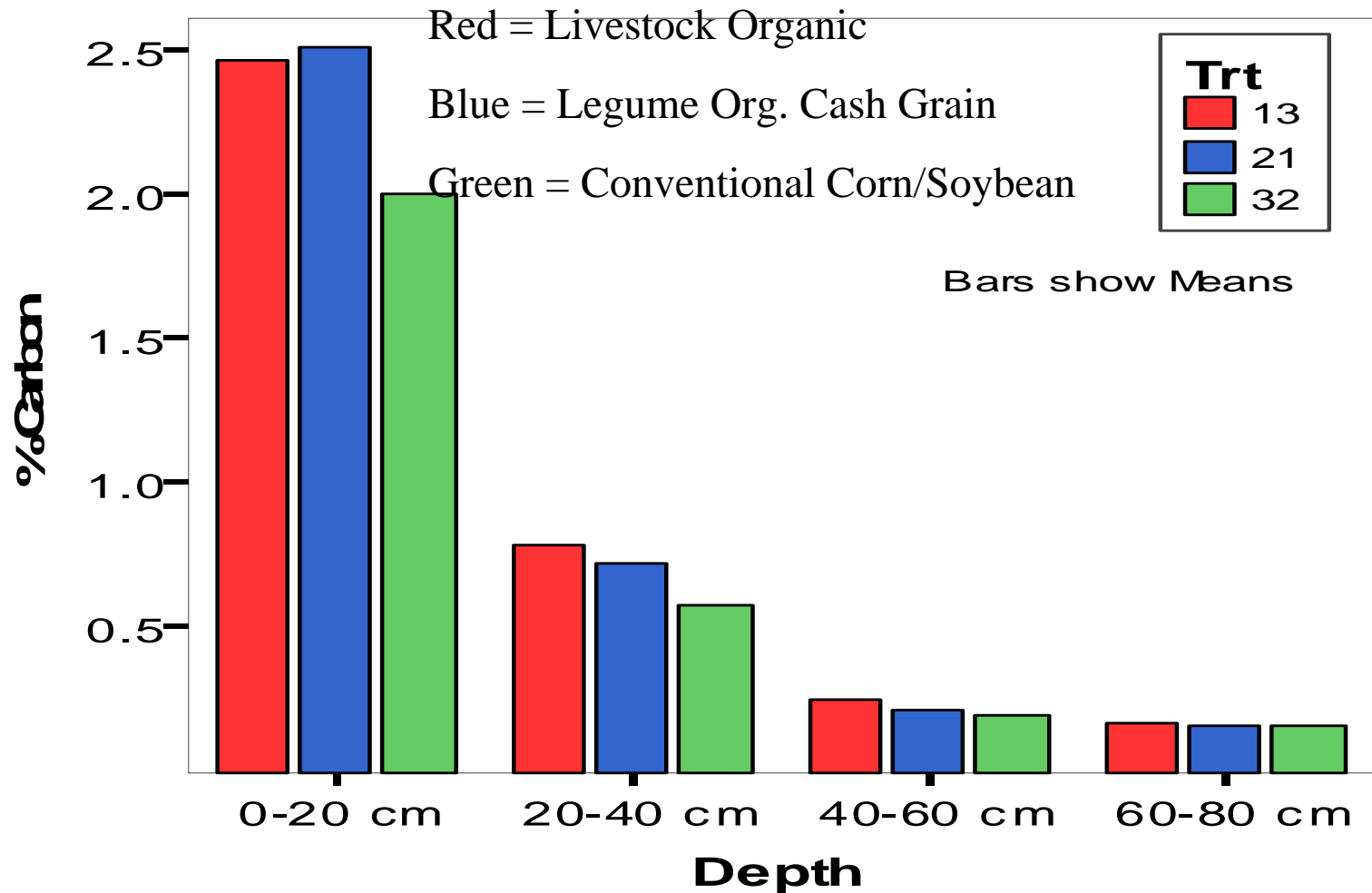




# Organic and Conventional: Side by Side

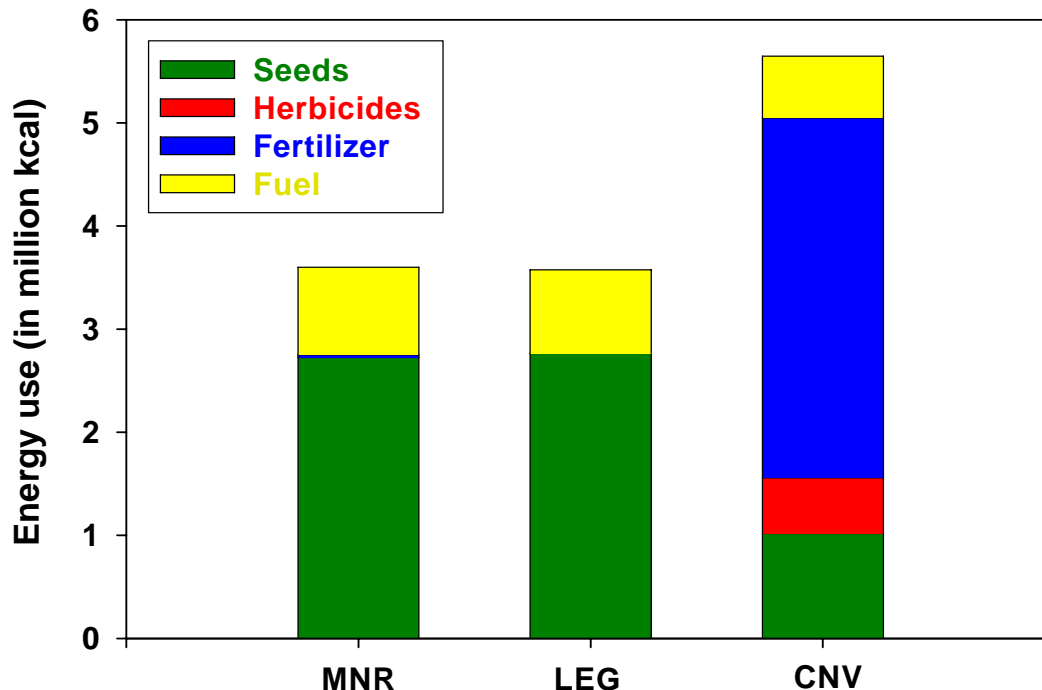


# Organic Agriculture Traps Carbon Deep In The Soil



# Agriculture Systems Use Energy!

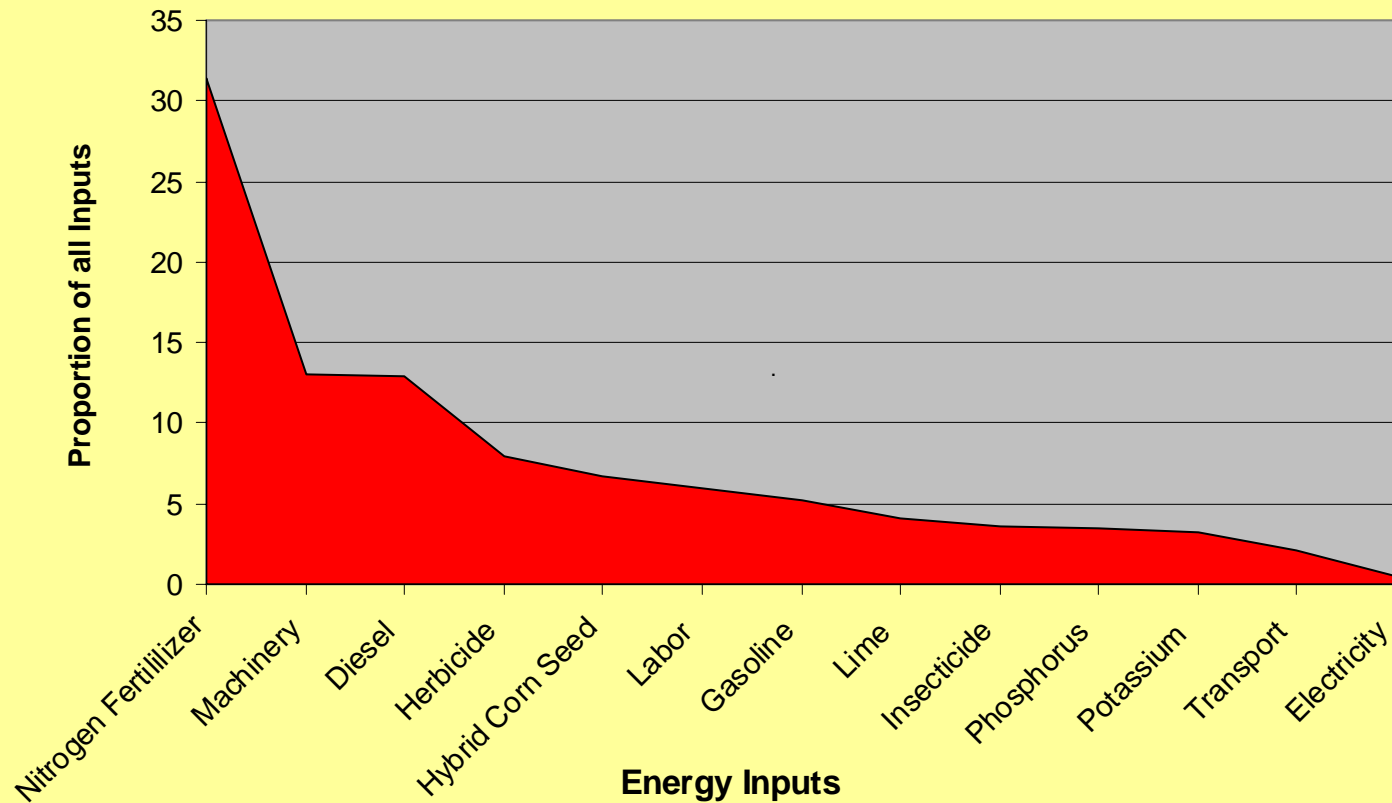
Energy use in the three systems of the Farming Systems Trial™



- Over half of conventional corn soybean energy input is for Nitrogen
- Over 10% is for herbicide input
- About 75% of organic energy inputs are for seed

# Fertilizers and pesticides main energy inputs.

Relative Energy Inputs Required for Conventional Corn  
Production Practices.



# No-Till Corn Starts with Hairv Vetch



# Successful Weed Control In Organic No-Till Corn



# 2002 FST Corn

## **PLOW TILL**

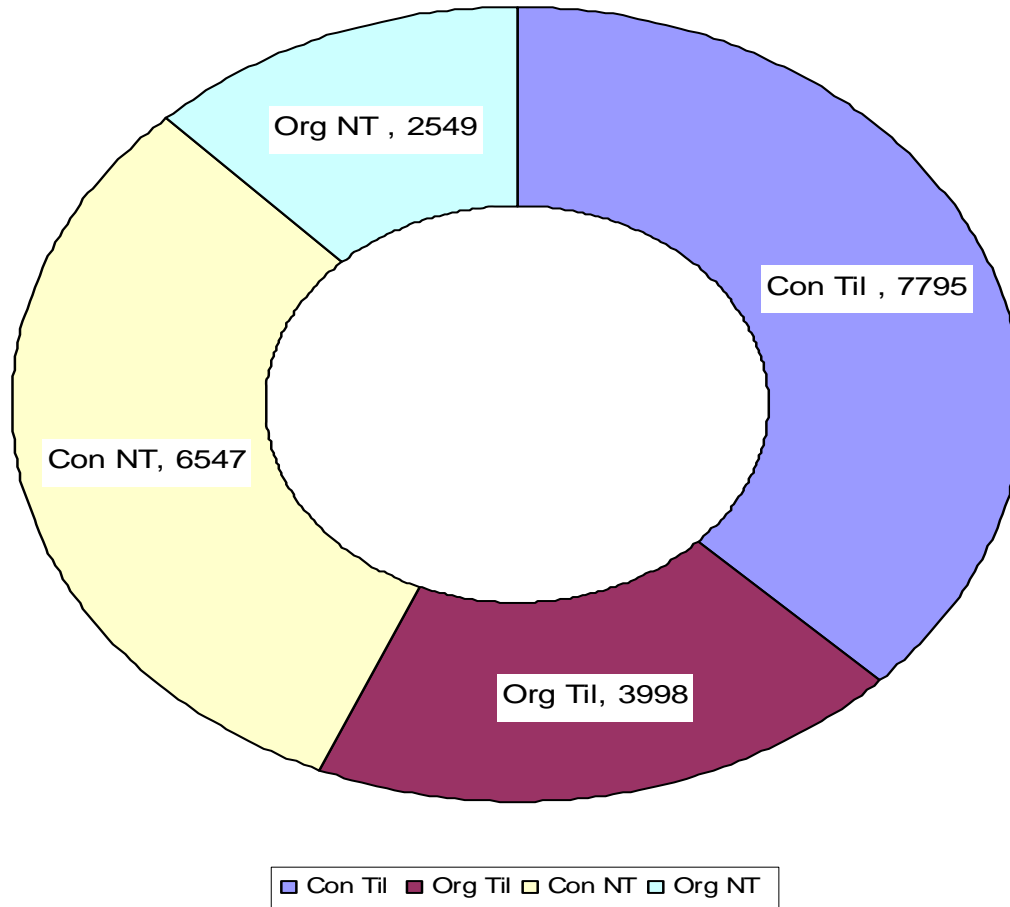
- **Plow**
- **Disc**
- **Pack**
- **Plant**
- **Rotary Hoe**
- **Rotary Hoe**
- **Cultivate**
- **Cultivate**
- **Harvest**

## **NO-TILL**

- **Roll/Crimp -  
Plant**
- **Harvest**



*Relative Energy Requirements (Mcal per Acre)  
of Different Corn Production Systems*



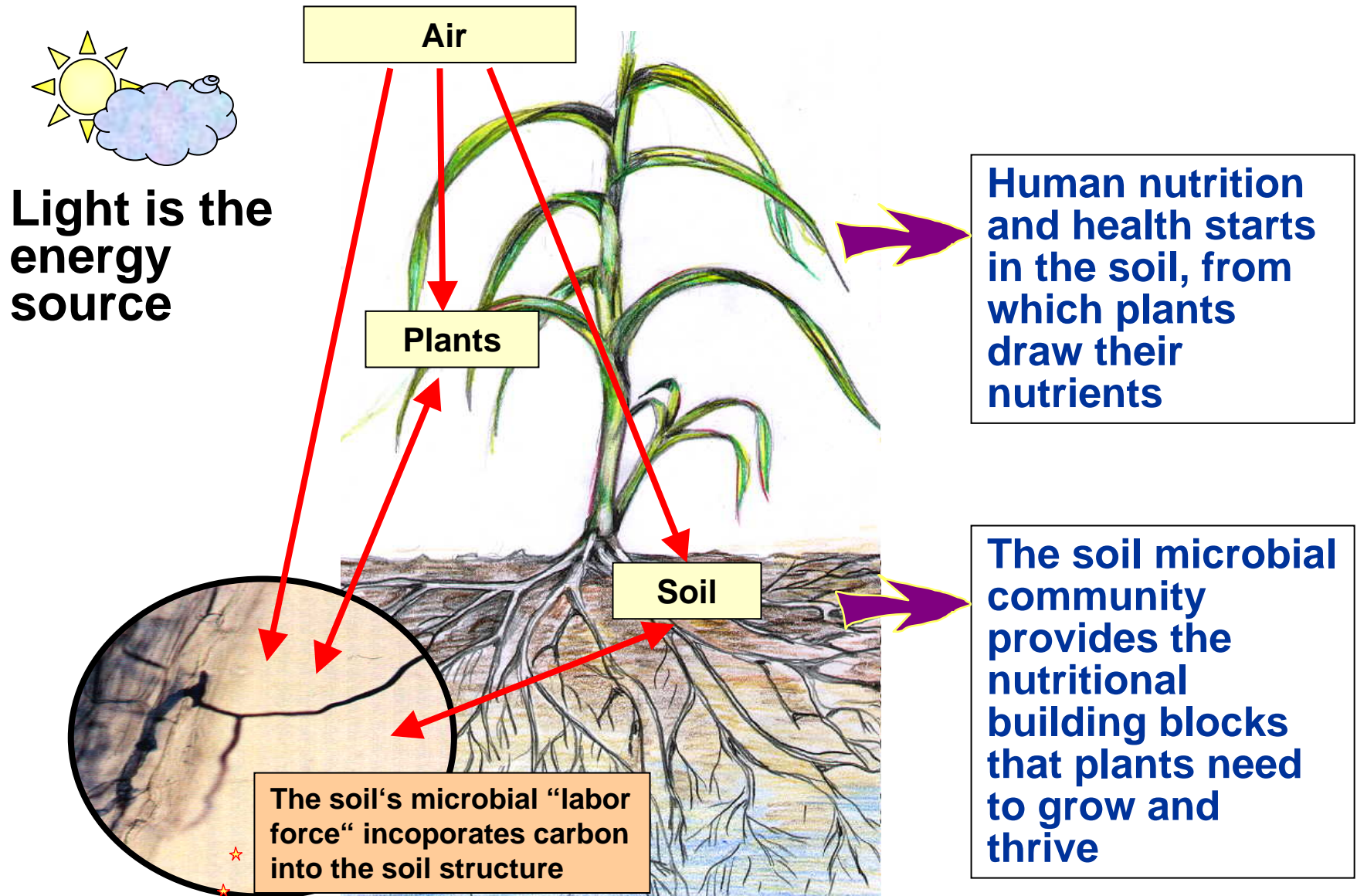
## Agricultural Practice

- Compost
- Cover Crop
- NoTill
- Crop Rotation
- Manuring
- Cover Crop & Rotation
  
- **Compost, Cover Crop, Rotation, & No-till**

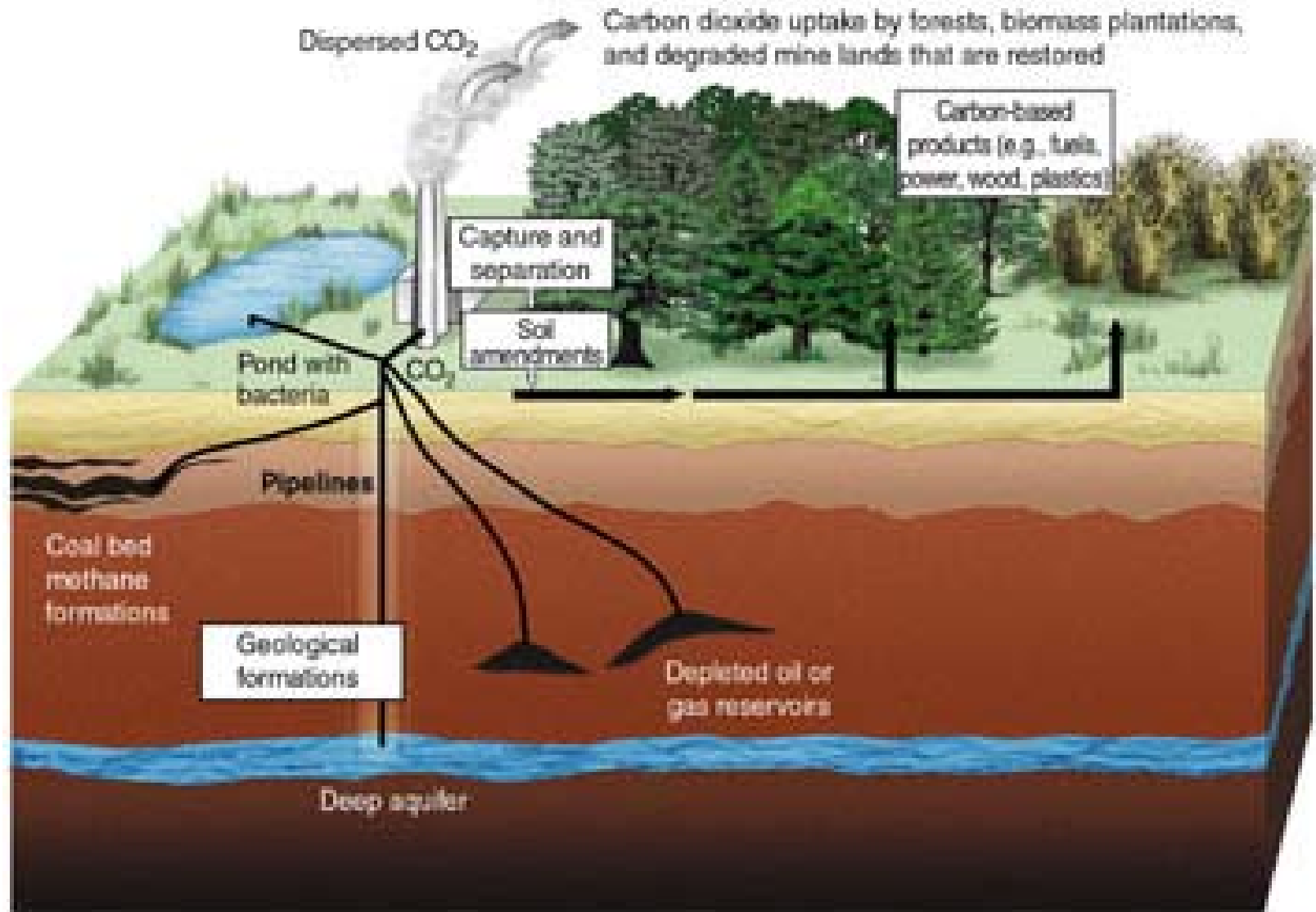
## Carbon (kg/ha/year)

- 1,000 to 2,000
- 800 to 1,000
- 100 to 500
- 0 to 200
- 0 to 200
- 900 to 1,200
  
- **2,000 to 3,000**  
(projected)

# Plants = Proven Carbon Sequestration



# Unproven Carbon Sequestration



# Unique and Important Results

- Long term focus creates the opportunity to see the accumulation of small annual differences into larger results
- Conventional and organic systems clearly accumulate carbon differently
- No guesses, projections, nor simulations... just real results from hard, statistically analyzed data

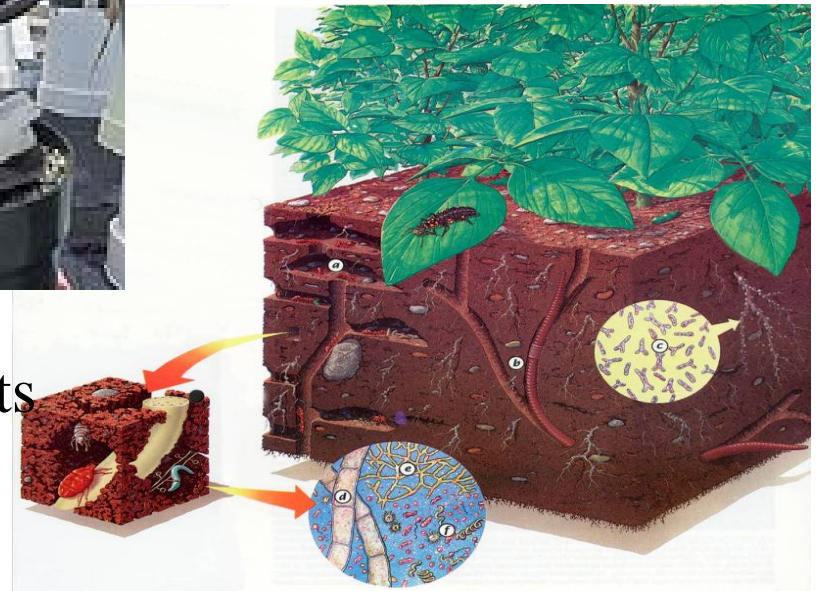


# Soil holds the Key

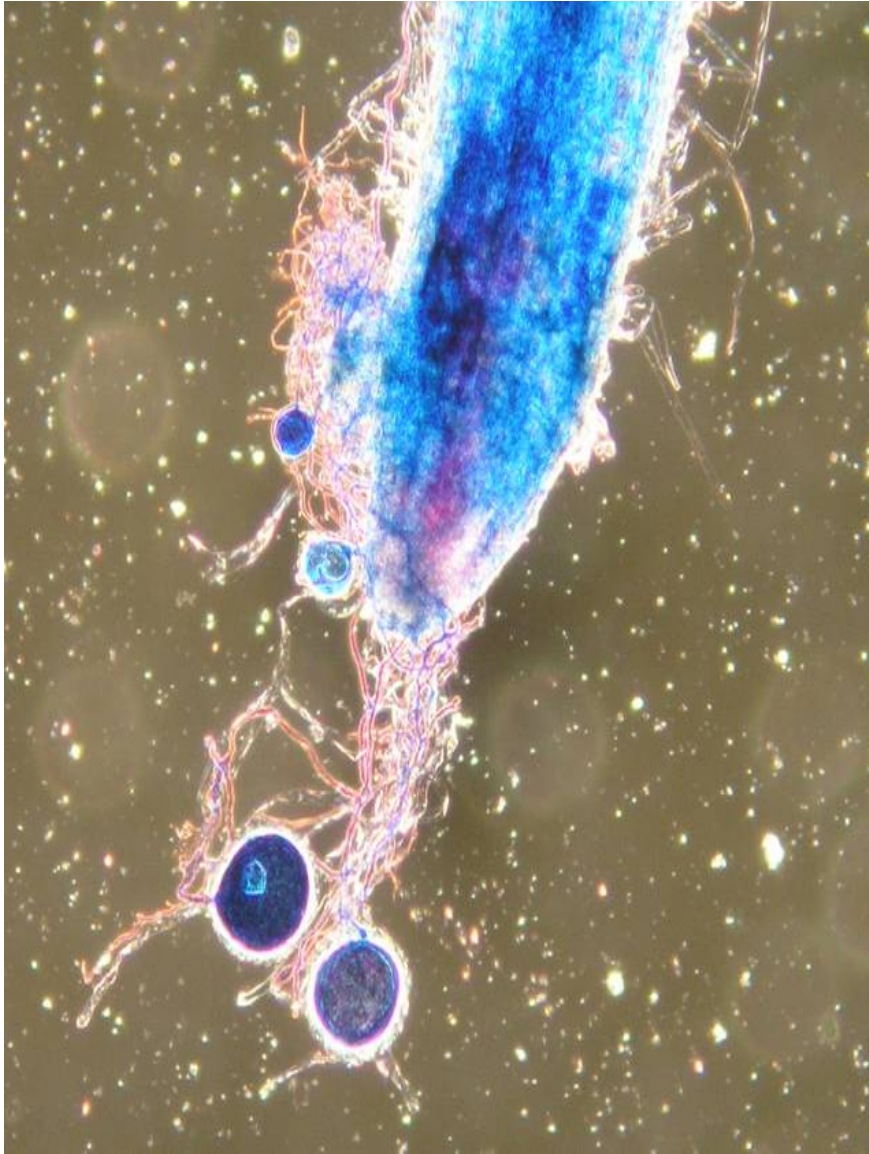


If people work to  
feed the soil...

... the soil will feed plants  
that will, in turn, feed  
people.



# Beneficial Root Fungi



- Extend plant root systems
- Produce erosion-resistant carbon enriched soil
- Provide mechanisms for soil biological carbon fixation
- Organic and no-till practices maximize

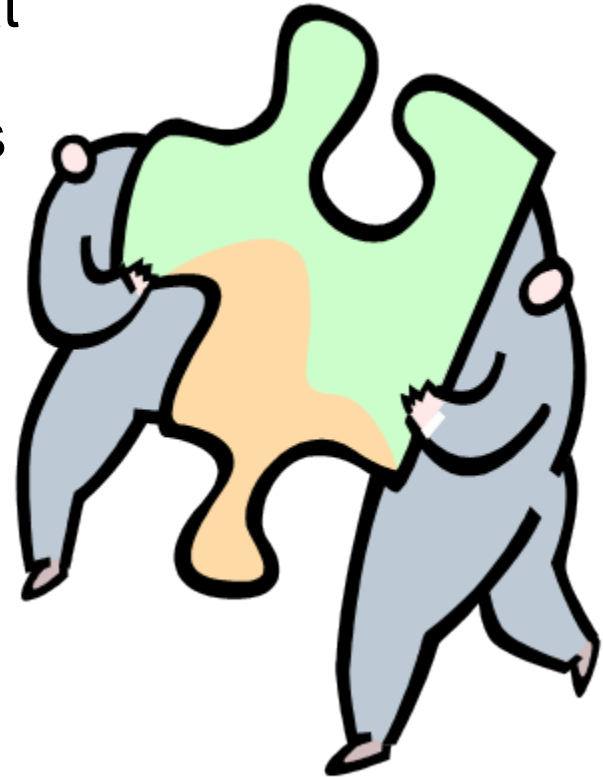
# Beneficial Root Fungi on Bahia Grass

**Dr. David Douds** -  
USDA-ARS  
Researcher,  
specializing in  
beneficial root fungi  
research for the last  
25 years



## Unique and Important Results

- Clarify the mechanisms that sequester carbon and nitrogen in agricultural soils
- Employ those mechanisms to maximize agricultural sequestration
- Collaborate to share these benefits with world-wide audiences



# Sequestration Benefits

- **Planet Earth** – **Reduced global warming!**
- **Agriculture, Forestry and Natural Areas** – **Opportunities to grow products, markets, and environmental resources**
- **Consumers** – **A reliable, healthy food supply**
- **Energy Producers** – **Carbon credit trading**
- **Policy Makers** – **Proven solutions, instead of large-scale, risky experiments**

# Carbon Crediting is Needed Now

- **We need a rapid cost effective and accurate system to give baseline soil readings and to be used for tracking results**



- The Veris Near Infrared (NIR) Spectrophotometer is the first available system for collecting geo-referenced NIR soil spectra on-the-go.
- NIR spectral measurements correlate with organic matter, carbon, pH buffer capacity, and soil moisture—and relate on a field-specific basis to other properties such as soil pH and phosphorous.
- An 1100-2200 nm spectrometer, collects 20 spectra/second with a resolution of 8 nm.

# Let Us Work Together for a Better Future

- Problem is well defined
- Solutions are well known
- The effect of not acting are catastrophic
- Everyone will gain.

