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Soil Health:
Research, Education, and Extension

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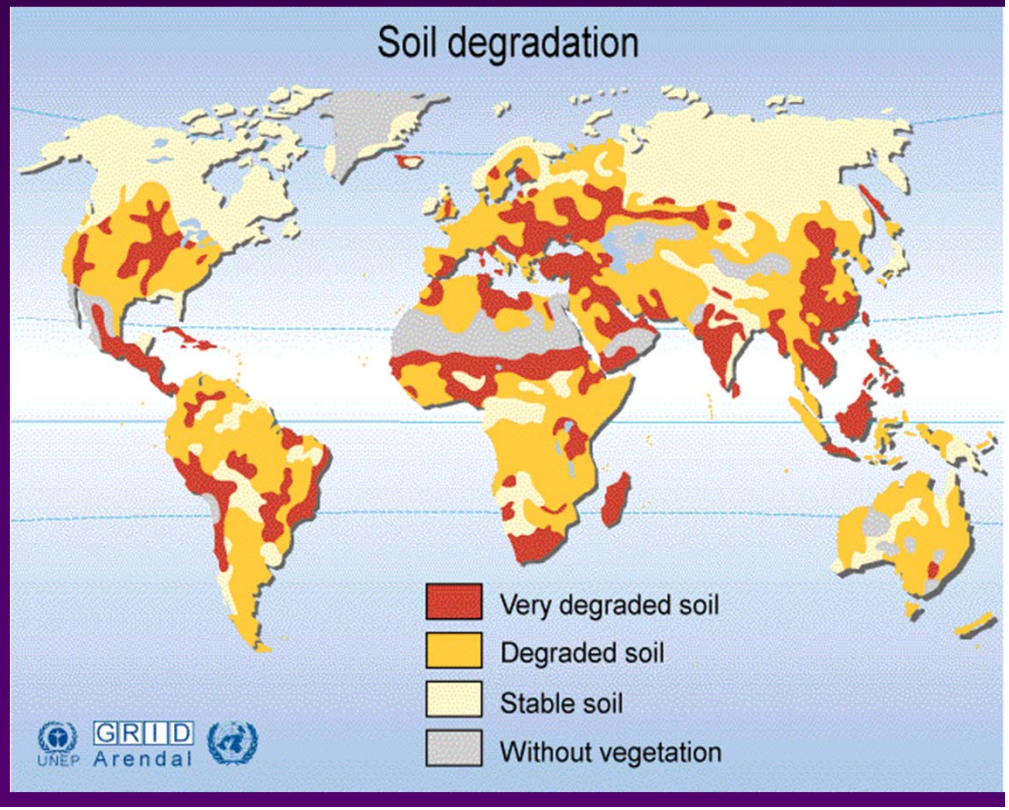
- Erosion
- Decline in organic matter
- Contamination (local and diffuse)
- Paving
- Compaction
- Loss of biodiversity
- Salinization
- Floods and landslides

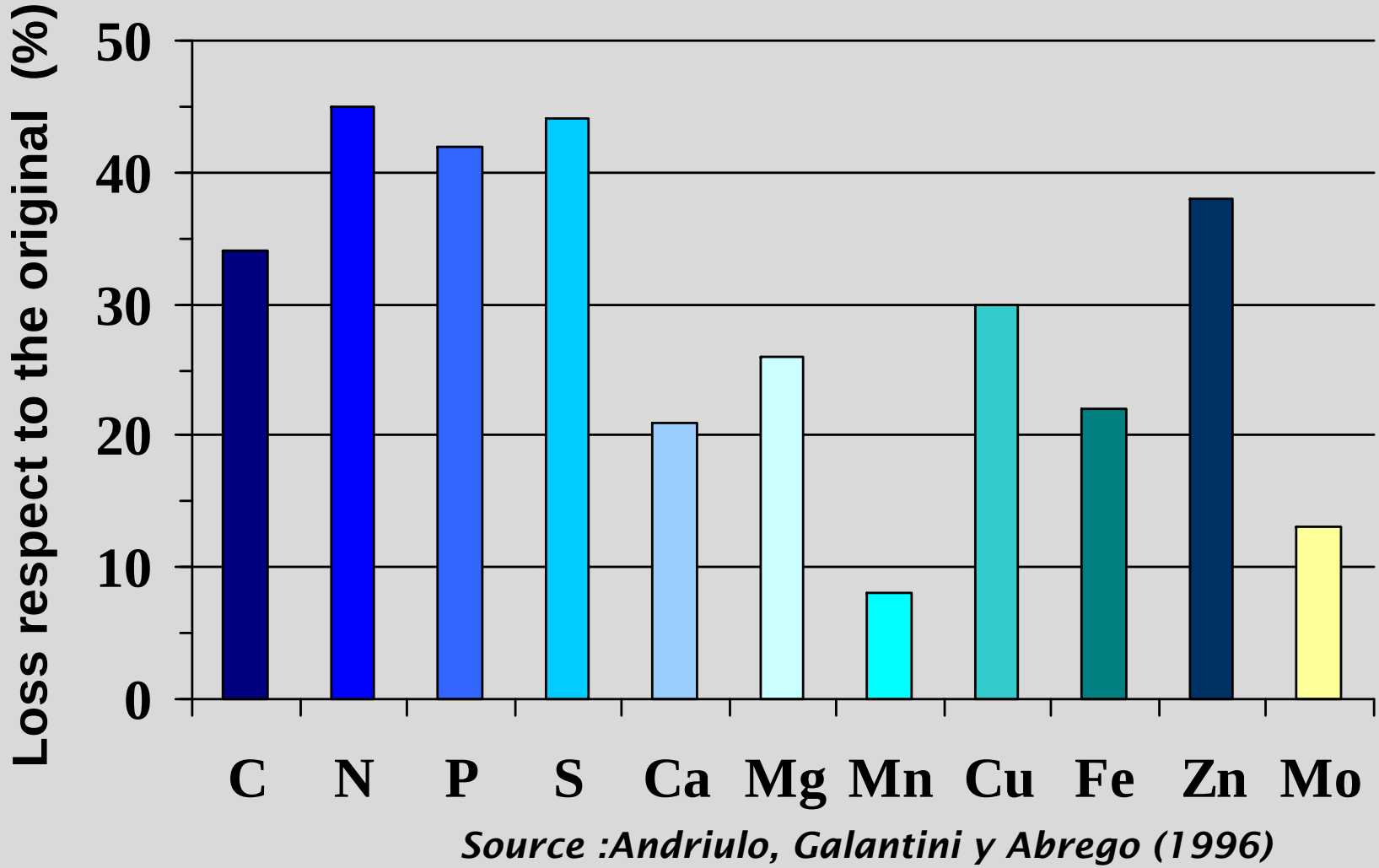


Lal et al., 2012. J. Soil Water Conserv. 67

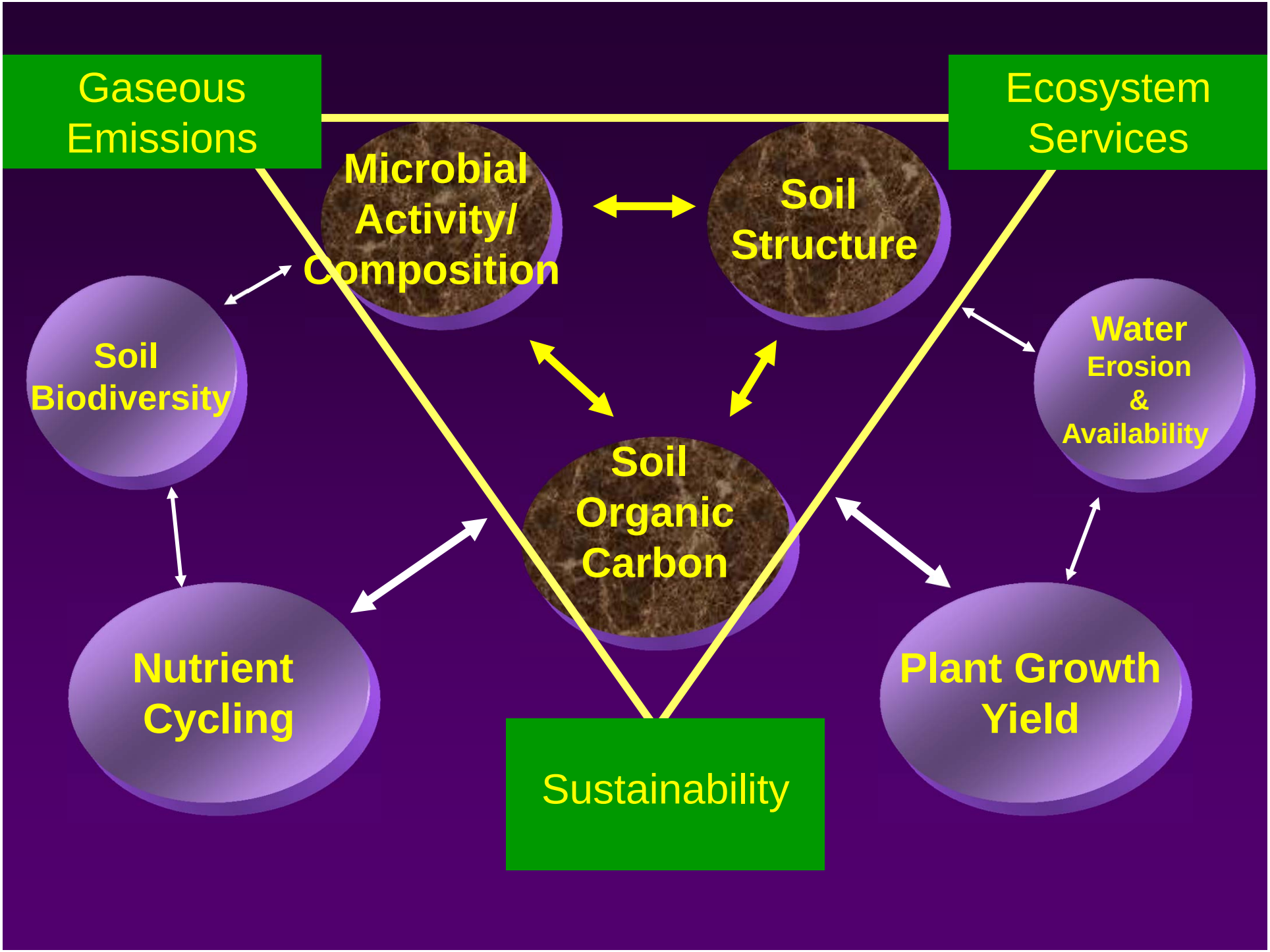
Soil degradation in the Pampean Region of Argentina

Nutrient losses after 80 years of continuous agriculture

Pergamino series - Typic Argiudoll



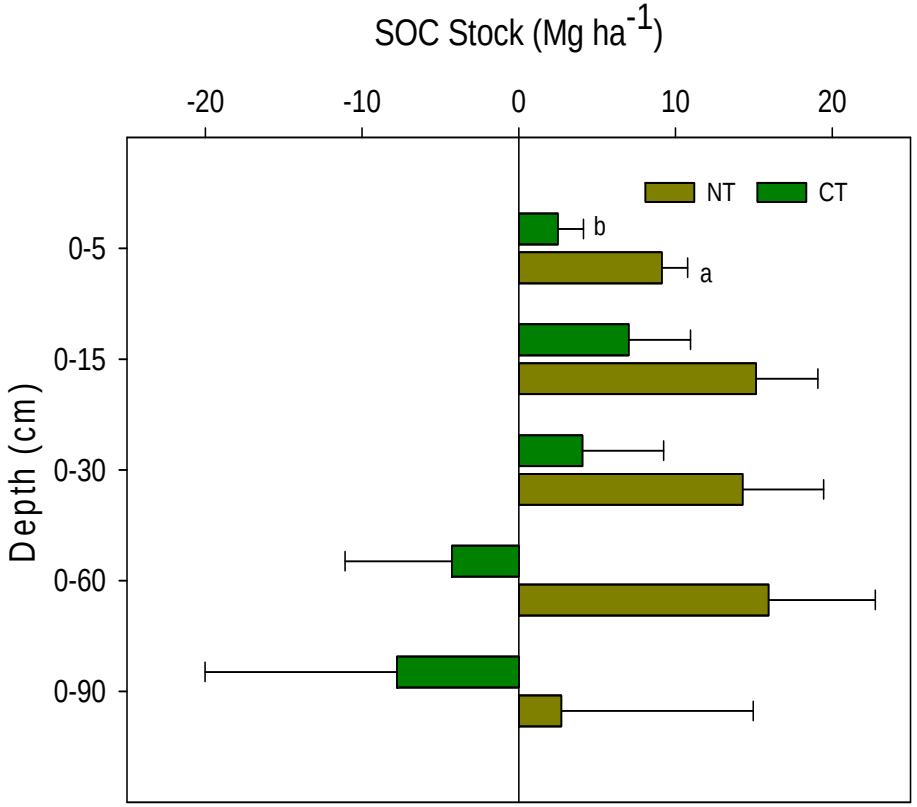
Source :Andriulo, Galantini y Abrego (1996)

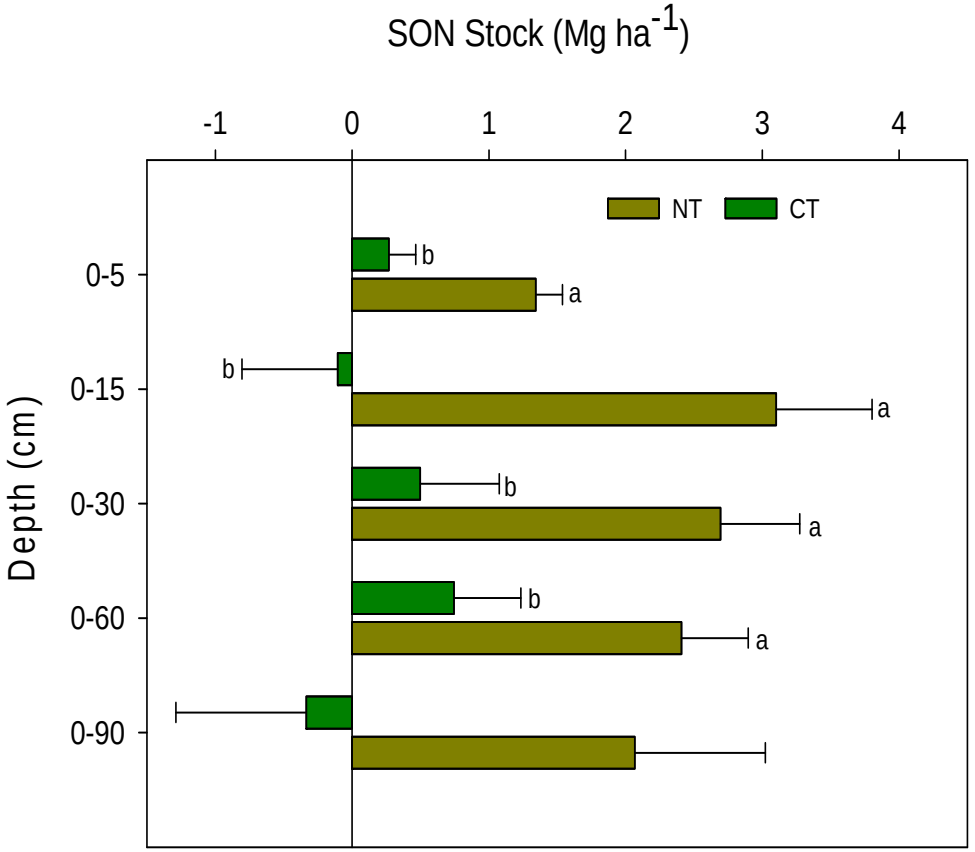

Gaseous Emissions
Ecosystem Services
Microbial Activity/ Composition
Soil Structure
Soil Biodiversity
Water Erosion & Availability
Soil Organic Carbon
Nutrient Cycling
Plant Growth Yield
Sustainability

No-Till Cropping Systems

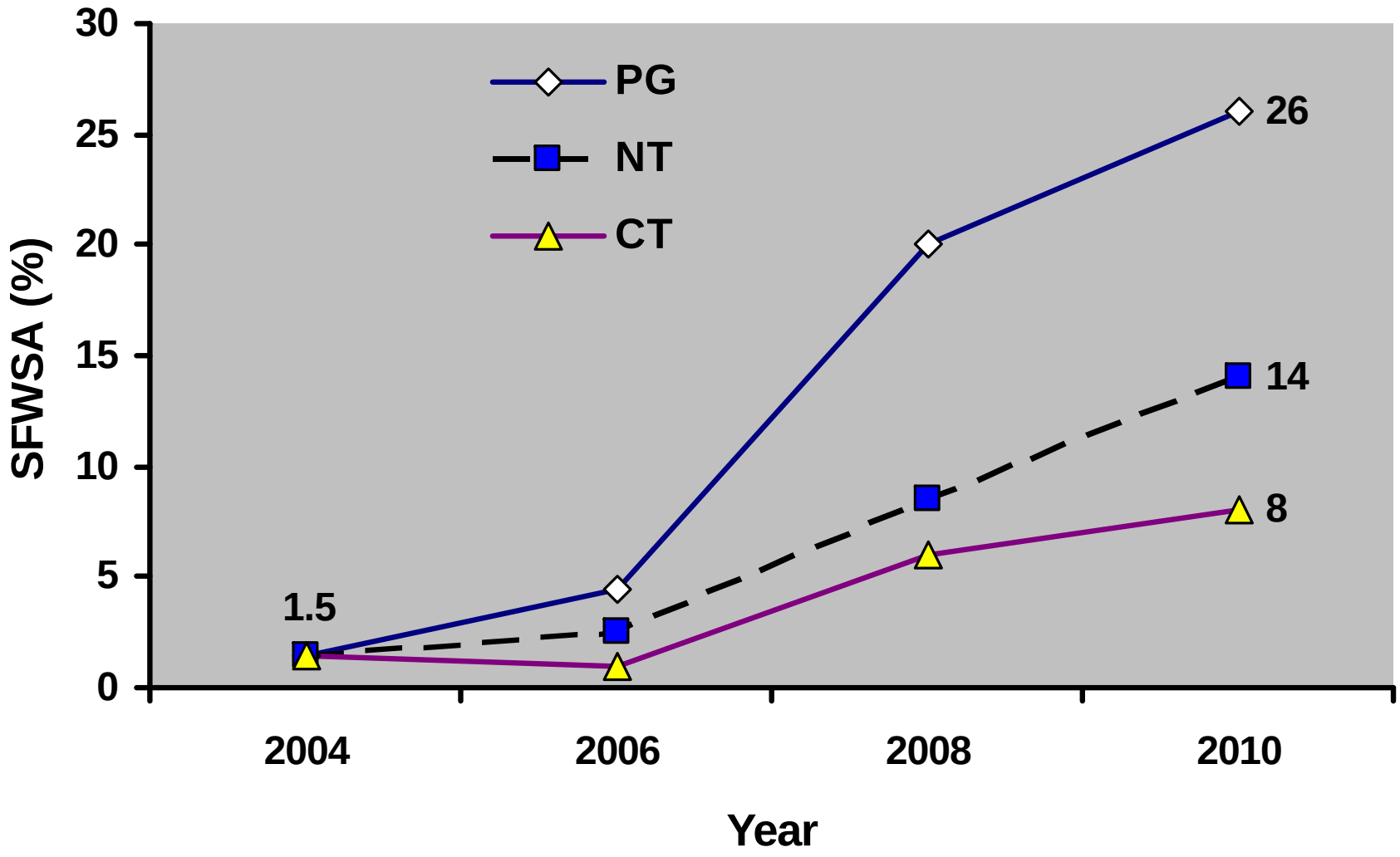
- Restores soil carbon
- Conserves moisture
- Saves fuel
- Saves labor
- Lowers machinery costs
- Reduces erosion
- Improved soil fertility
- Controls weed
- Planting on the best date
- Improves wildlife habitat

SOC and N change affected by tillage





Change in macroaggregate (>2000 um) over time



PG: prairie grass (big bluestem); NT: No-till sorghum; CT: Conventional till sorghum.
SFWSA: sand-free water stable aggregate (Mfombep and Rice 2014)

Increased Soil Health

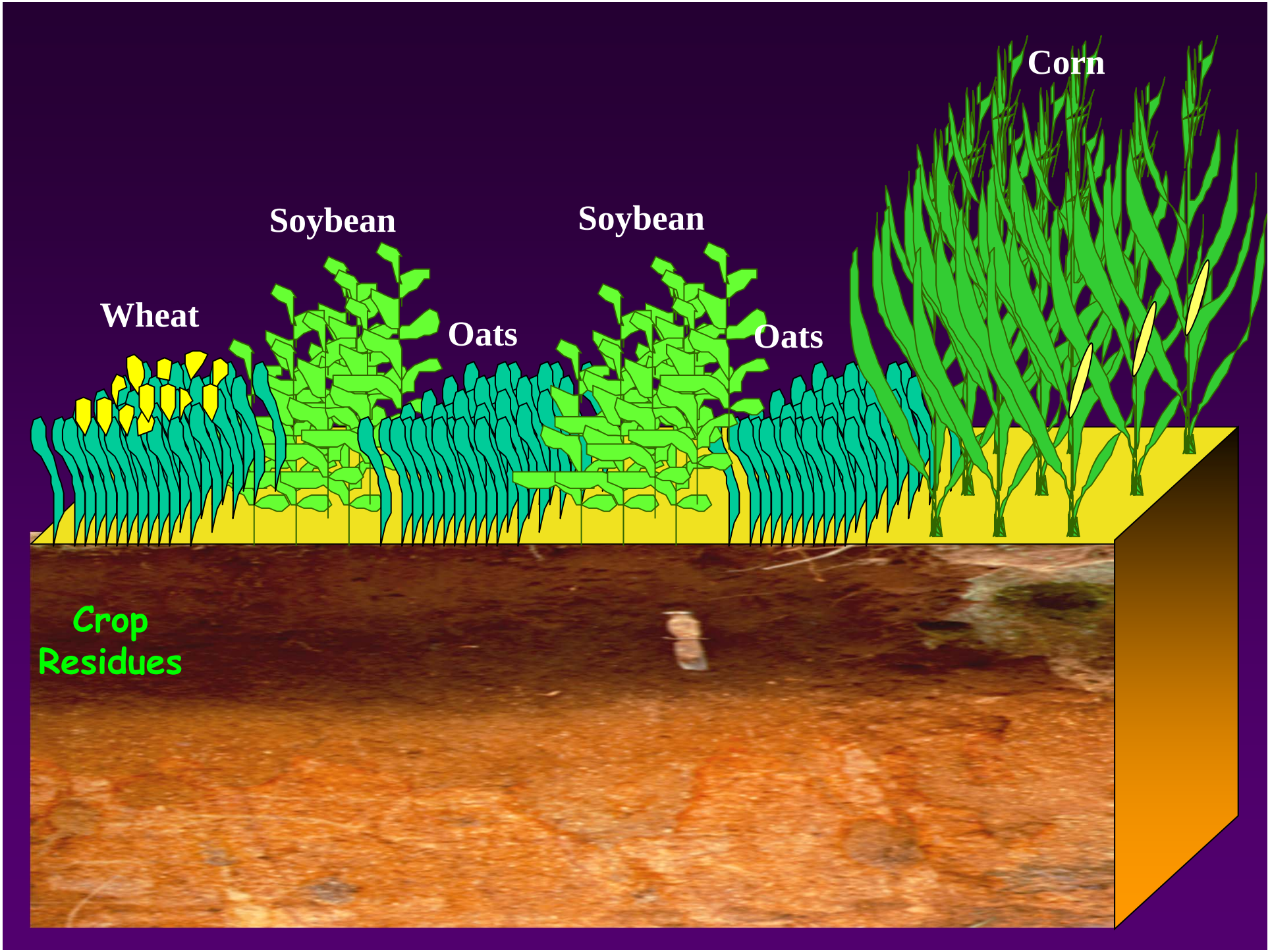
- Higher soil organic matter
- Better soil structure
- Greater microbial activity
- Regional projects on soil quality/soil health 1990's (Universities, USDA-ARS)
- Greater resilience
  - Water
  - Nutrients
- Greater yield stability

How do I assess soil health?

- **Standard soil chemical tests**
  - **Organic C and N**
  - **Available Nutrients**
    - **Are our current soil nutrient tests appropriate?**
  - pH
- **Additional**
  - **Aggregate stability**
  - **Mineralizable C and N**
  - Bulk density
- **Biological**
  - **Activity**
  - **Biomass and Composition**

Keys to Future Agricultural **Systems**

- Focus on Soil Health
- Intensify Systems:
  - Fertilizer, water and energy management
    - **Efficiency not inputs**
  - Crop rotations
- Diversify Systems:
  - Crop rotation and management


Corn
Soybean
Soybean
Wheat
Oats
Oats
Crop
Residues

Summary

As we improve soil health

- How do we assess?
  - Chemistry and physical ok?
  - Biology assessment needs further development
- Are our current nutrient recommendations adequate for soils with high soil quality?
- Dynamic system: what is next?

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