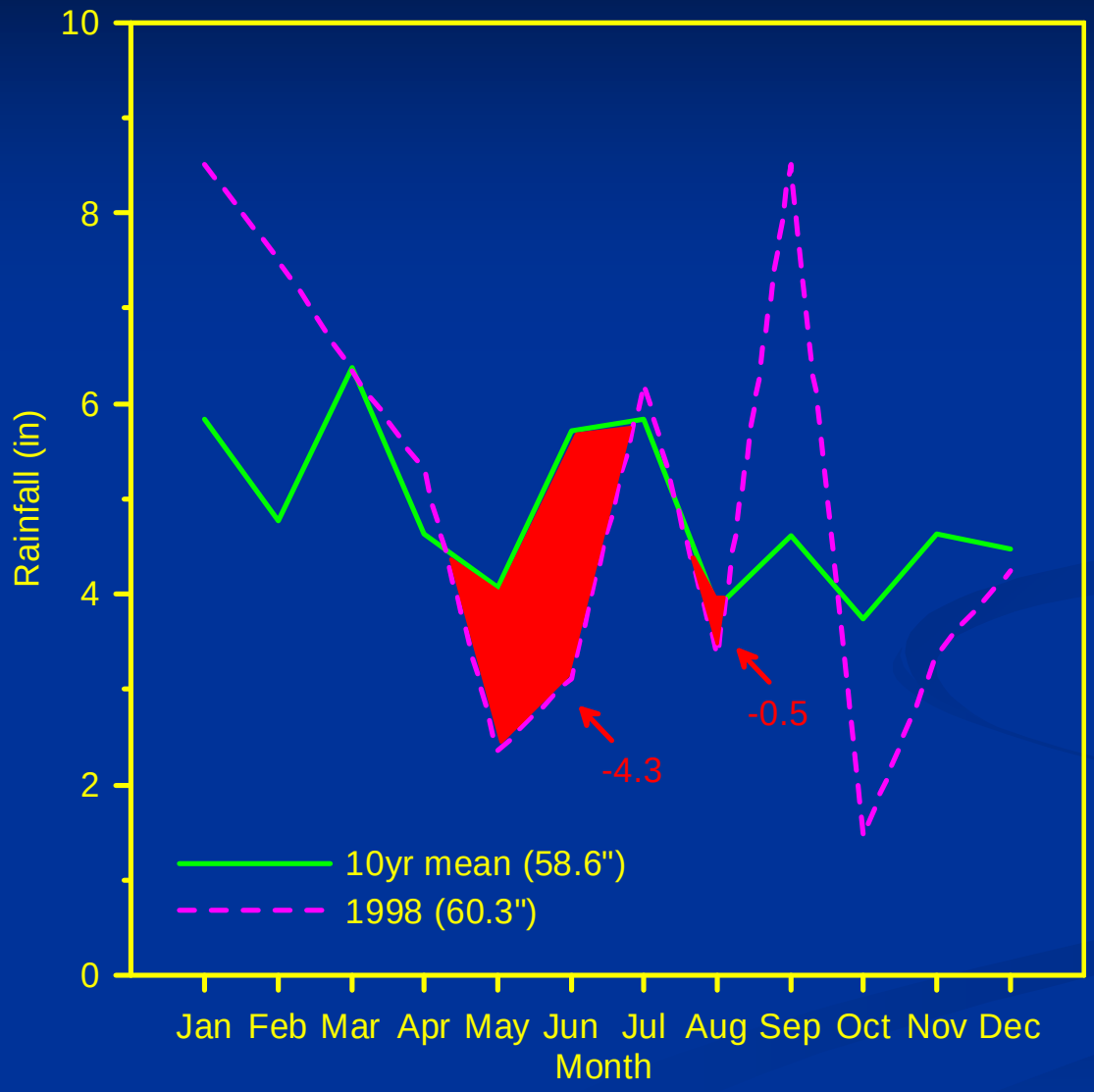
Agriculture/Systems

Conservation ~~Tillage~~ for Water Conservation

Soil Quality Workshop
Soil and Water Conservation Society Annual Conference
Tampa, Fl
July 25, 2007

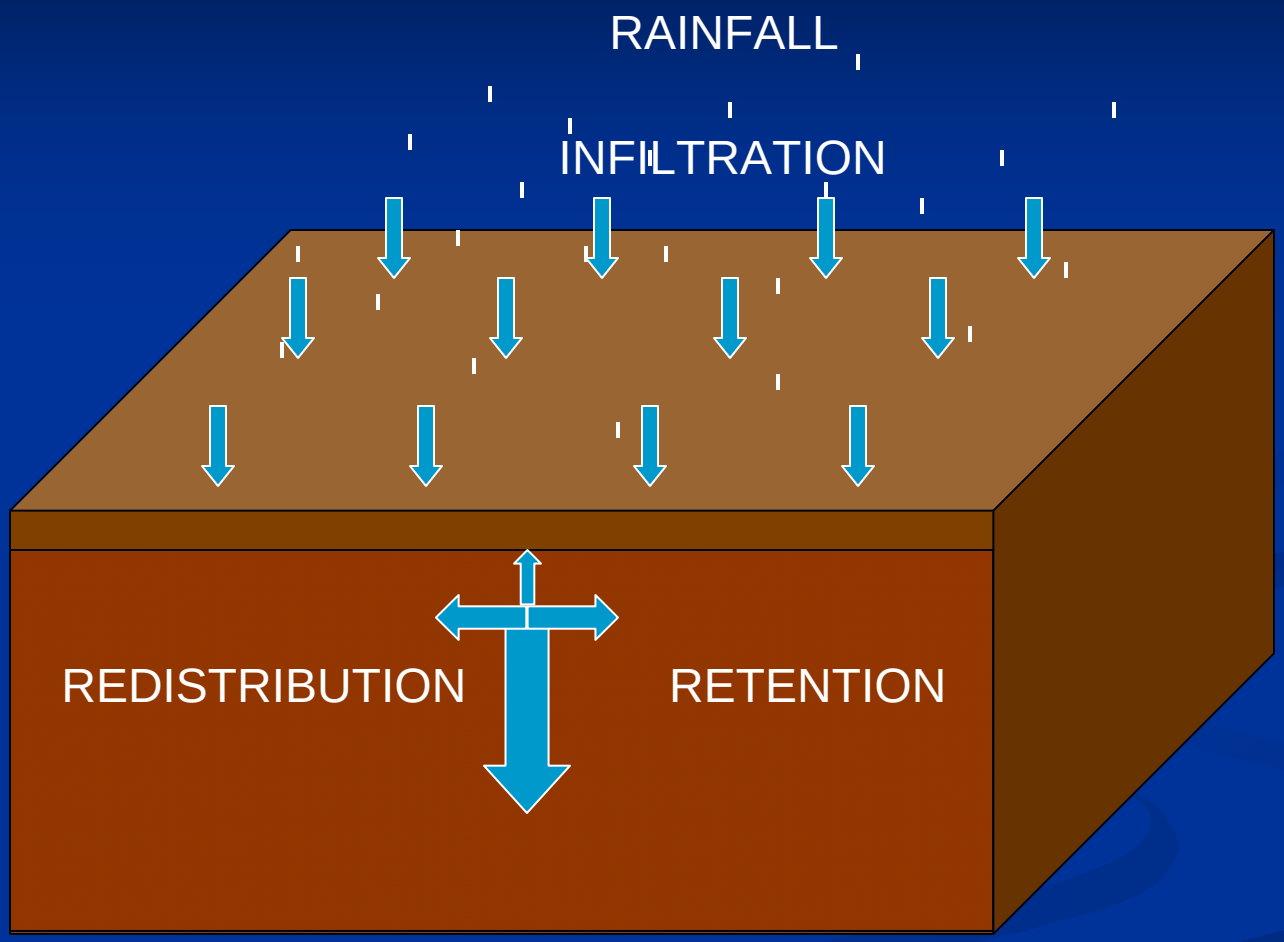
Francisco J. Arriaga
USDA-ARS
Auburn, AL

Rainfall 1998



1998 State yields 51 lb/ac below the 10 yr. average.

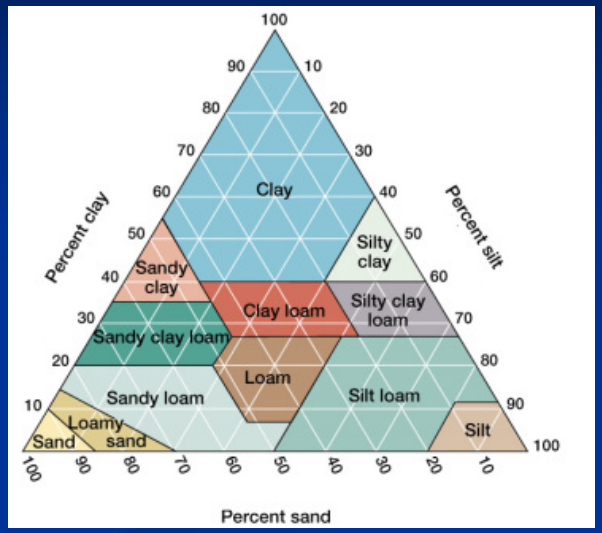
Water Pathway

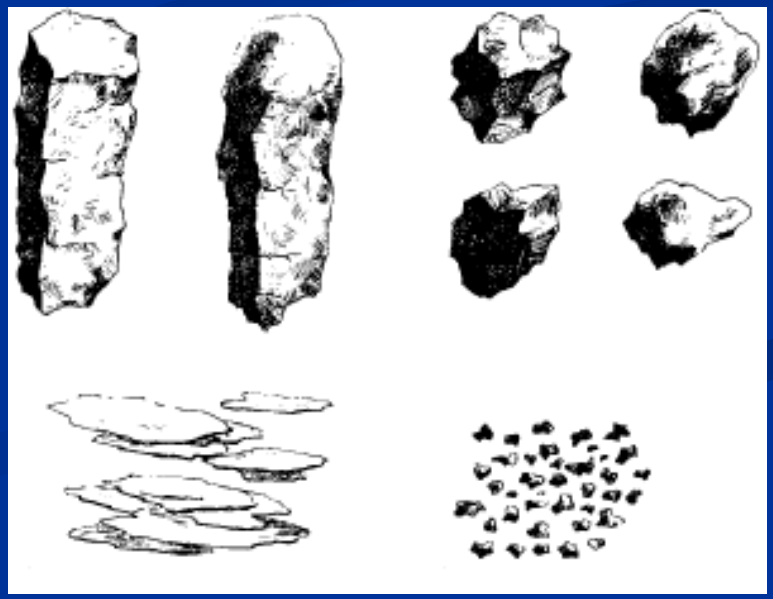


Soil Structure

- Texture (sand, silt & clay)
- Aggregates

Stable organic matter works as a “glue”.





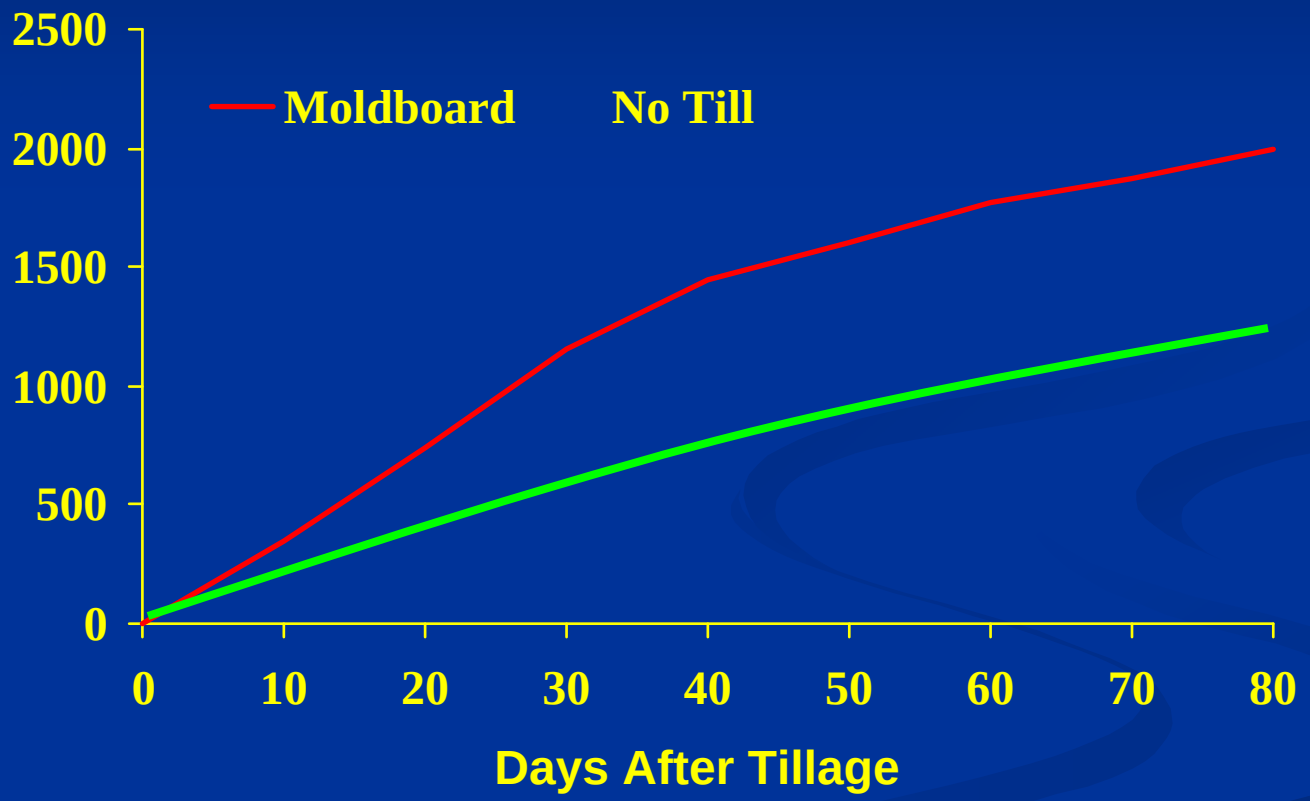
Soil Water Retention/Infiltration

- Soil Properties that Mainly Affect Water Retention/Infiltration:
  - Texture
  - Organic Matter
  - Bulk Density (compaction)
- Soil Properties that can be managed:
  - Organic Matter
  - Compaction (bulk density)

Benefits of Conservation Systems

- Soil erosion control
- Increased soil quality
- Increased water infiltration and storage
- Protect surface waters (e.g. streams and lakes)

CO_2 Losses: No-till vs Moldboard



(Rochette and Angers, 1999)

Soil Carbon Loss

Conventional Tillage

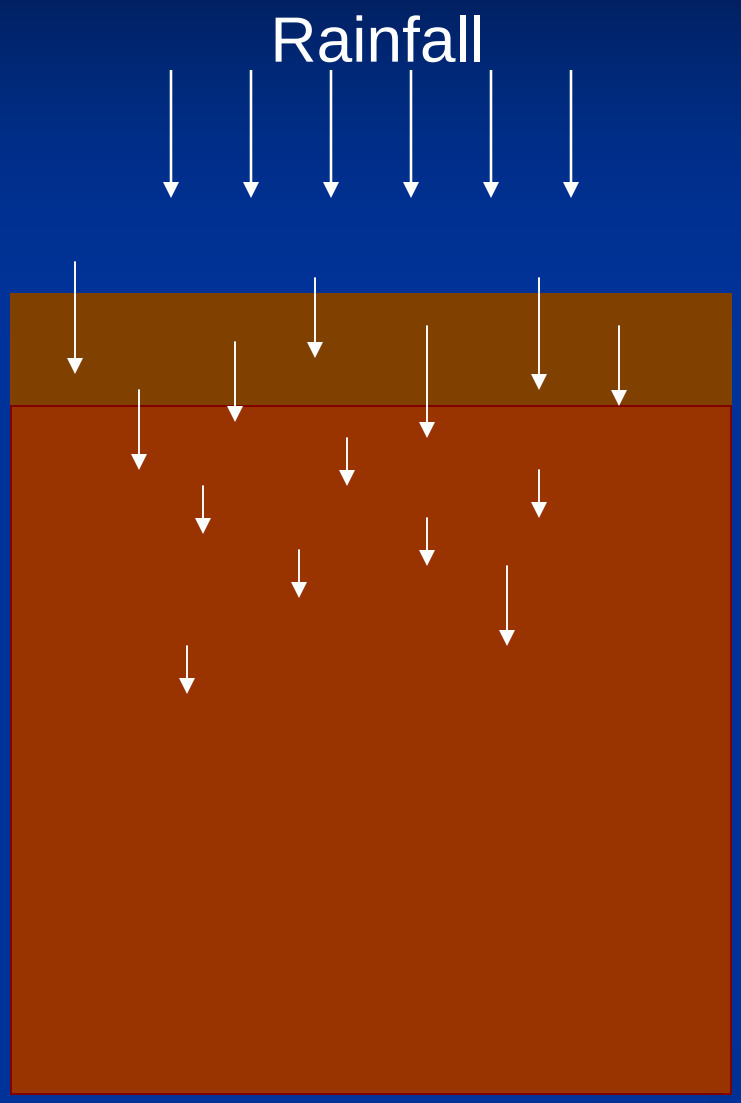
- 0.05% loss first 5 hrs.
- 0.10-0.15% in 30 days.
- ~1 - 1.5% in 10 years.

Conservation Systems

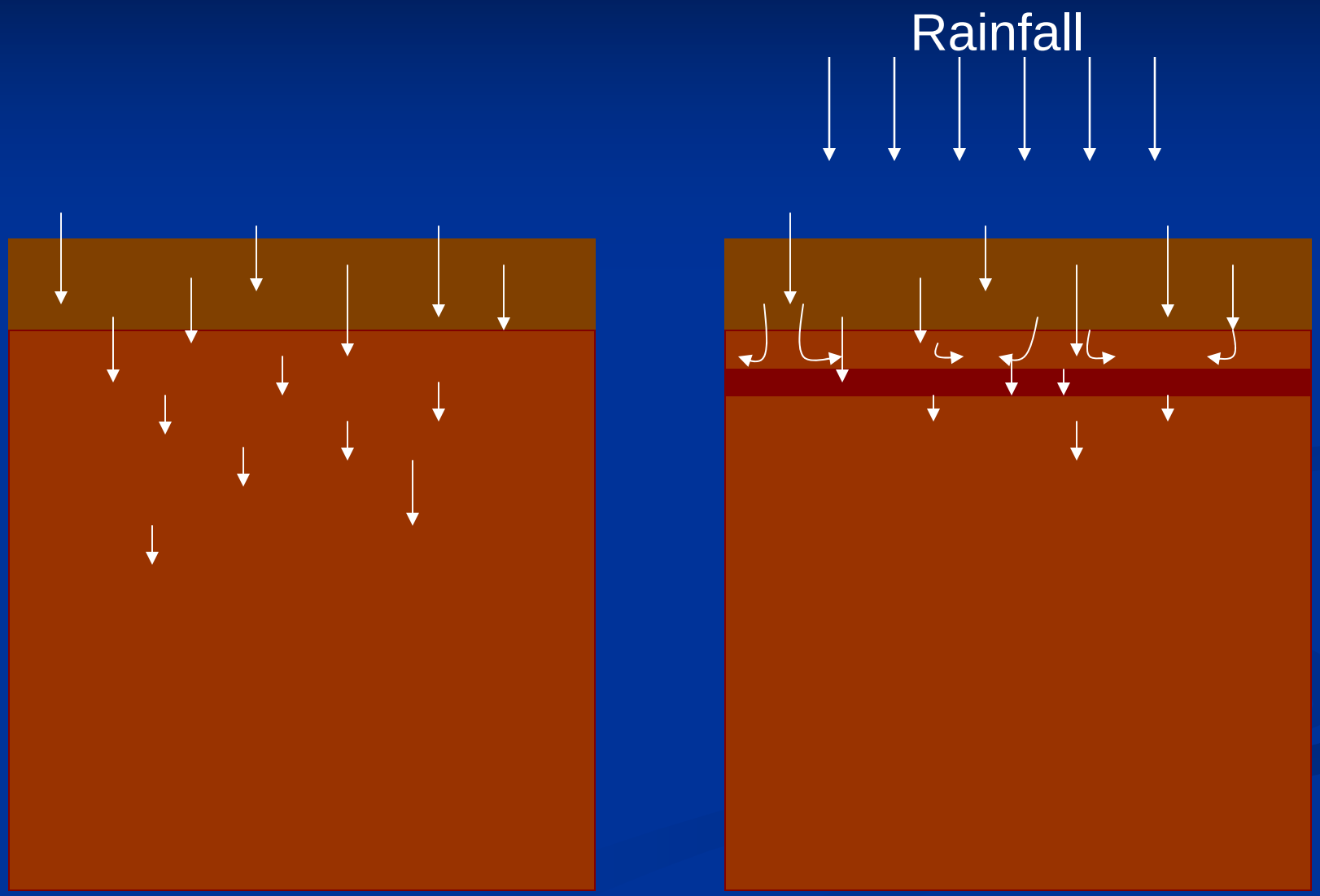
- Loss 10-15 times lower with conservation tillage.
- Winter cover; ~4,000 lb/ac.
- 1,600 lb Carbon /ac (not counting roots).

Soil Compaction

Soil Compaction



Soil Compaction



Conservation Systems

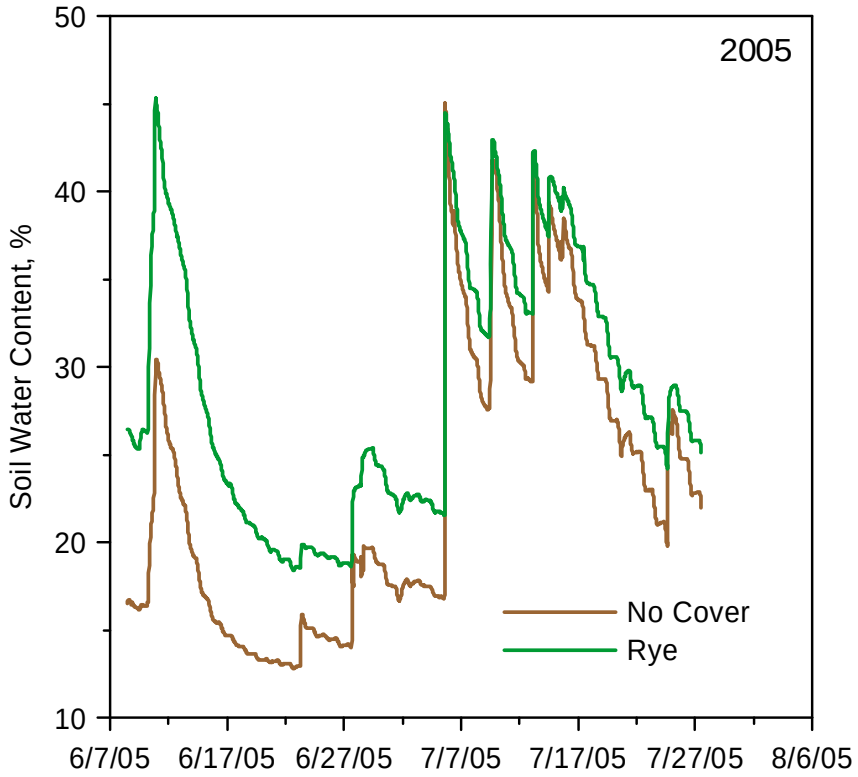
Conservation Tillage

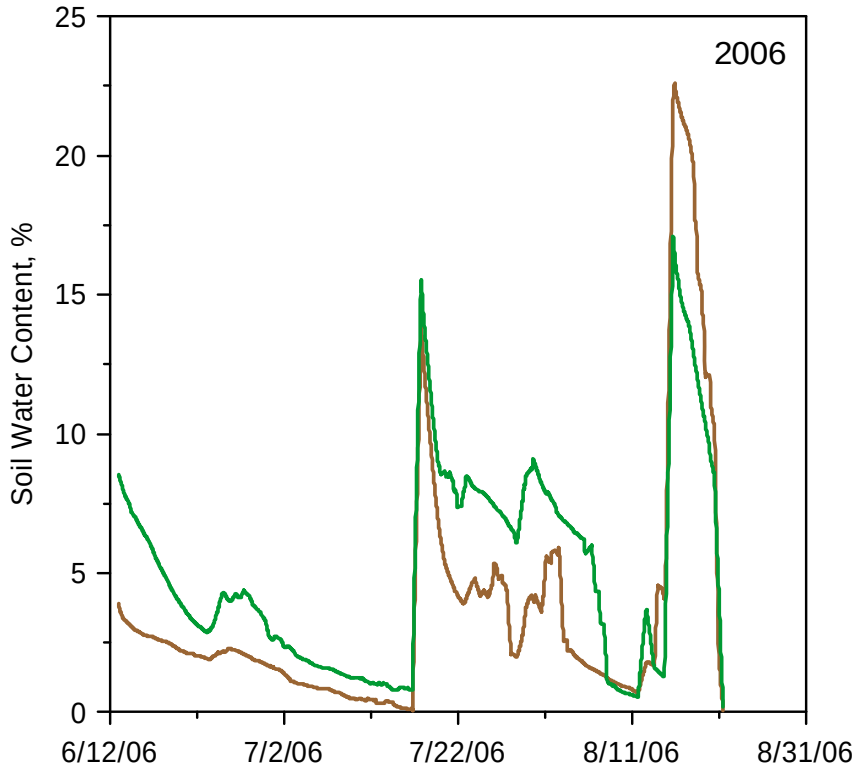
Cover Crops

Crop Rotations

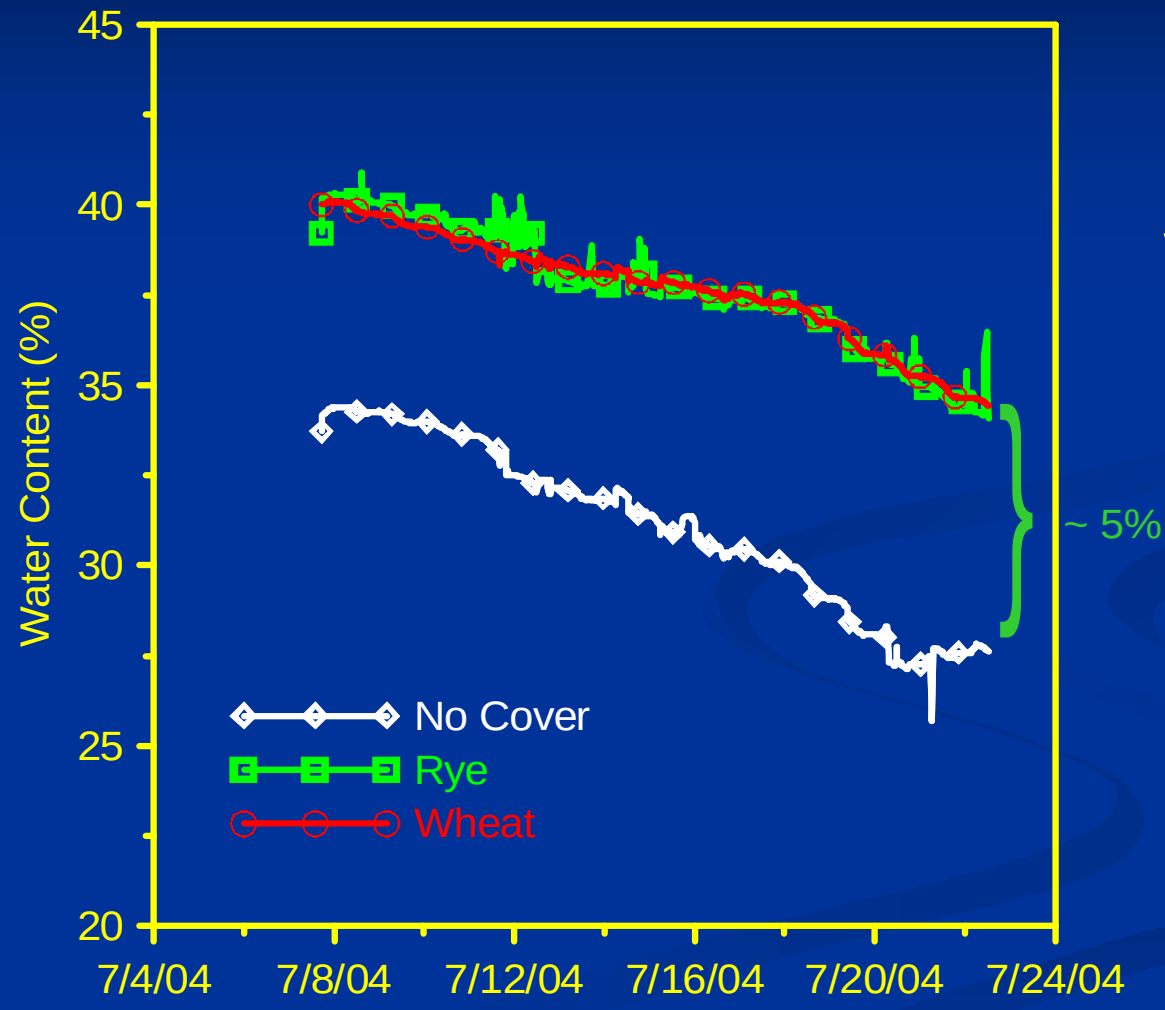
Cover Crops

Soil Water Content-Cover Crop

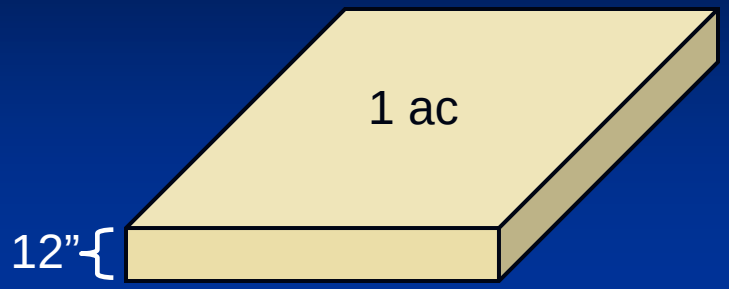




Water Content-Cover Crop



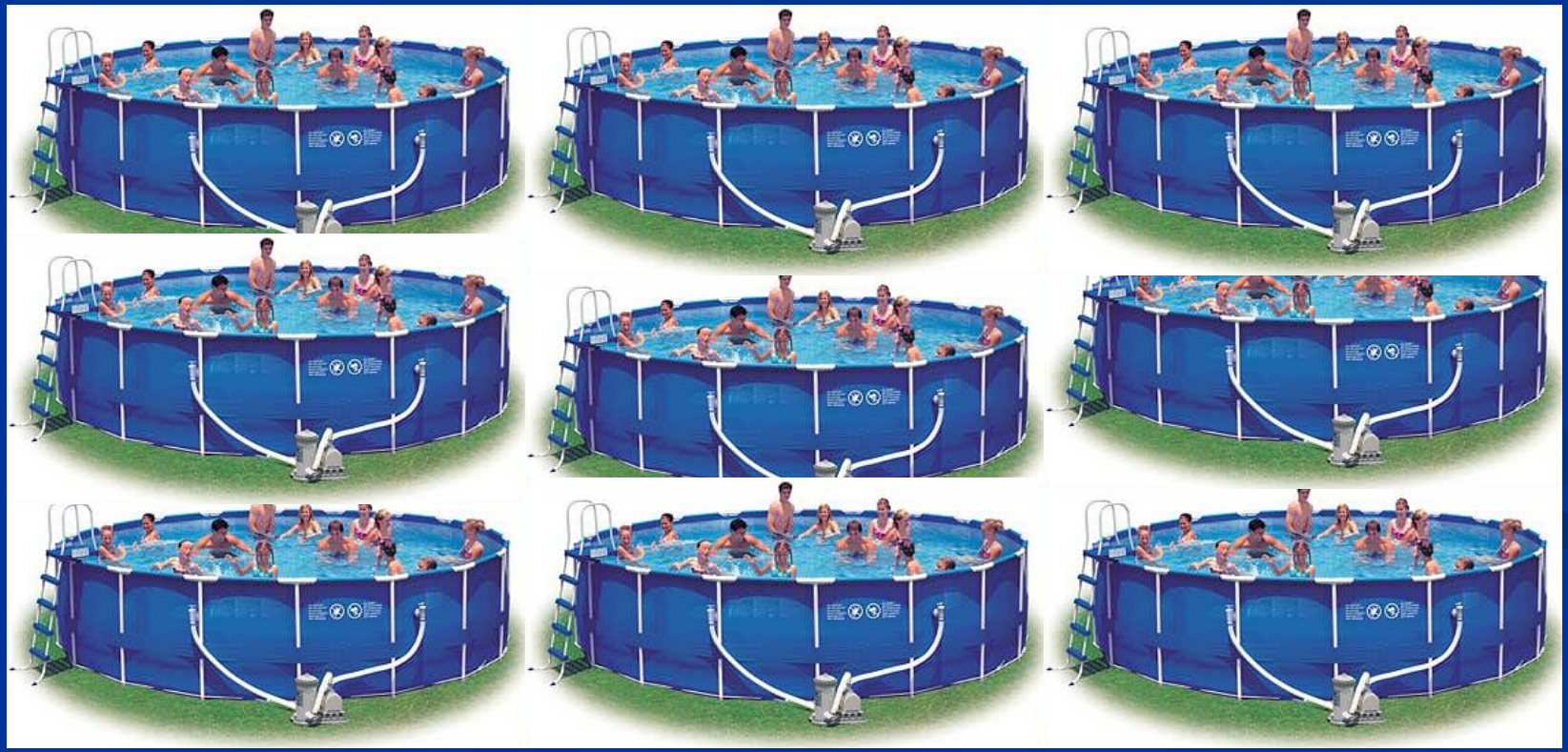
Biomass
(lb/ac)
Rye 4,607
Wheat 3,287



x 5% vwc = 16,291 gal water

Additional Water (1rst year)

- 0.6” of water in the top 12”.
- 1.8” of water in top 36” (~50,000 gal).
- ~5 - 7 days of additional water for cotton.



Cotton Yield

Biomass
(lb/ac)
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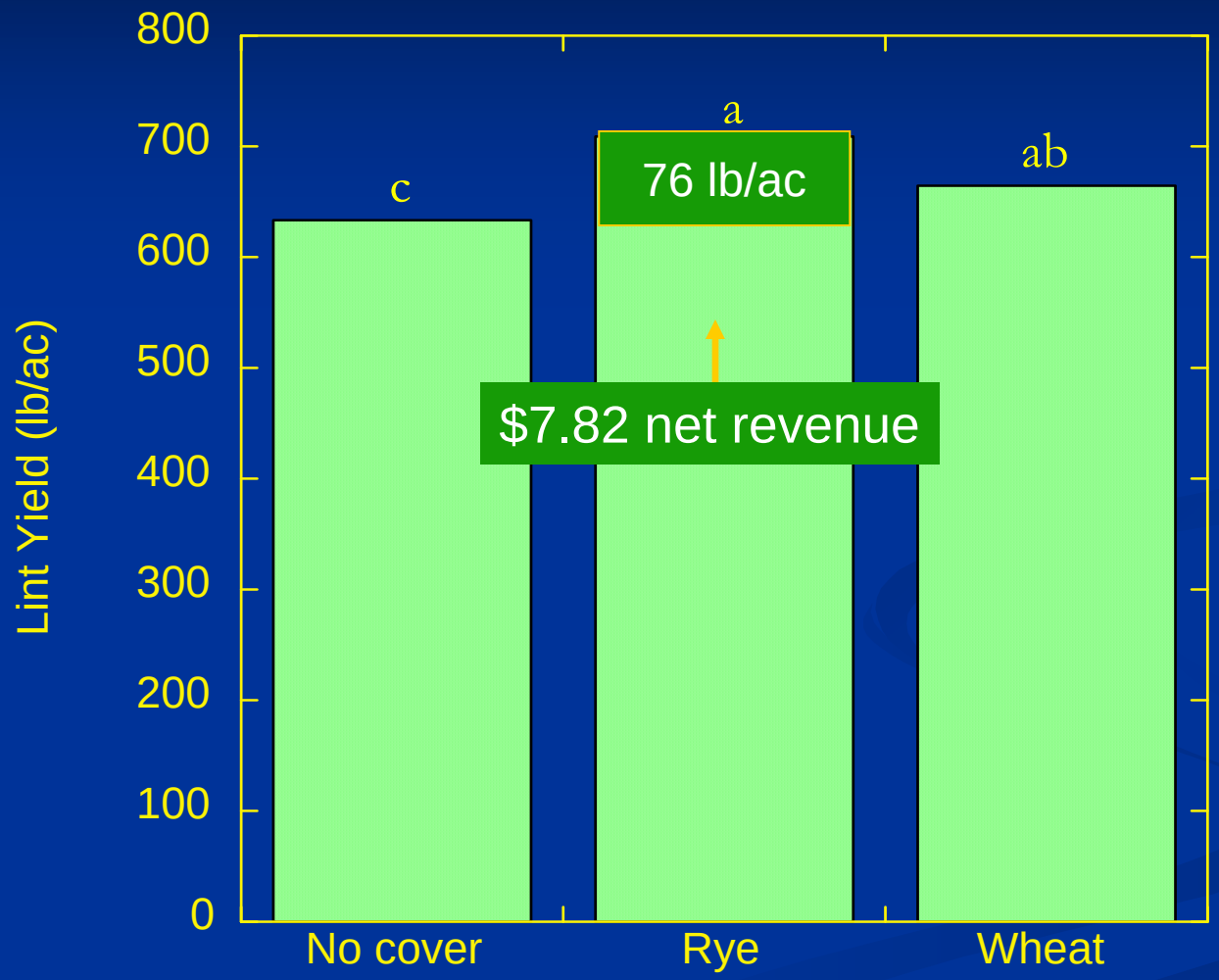
Wheat 3,287

Cotton Yield

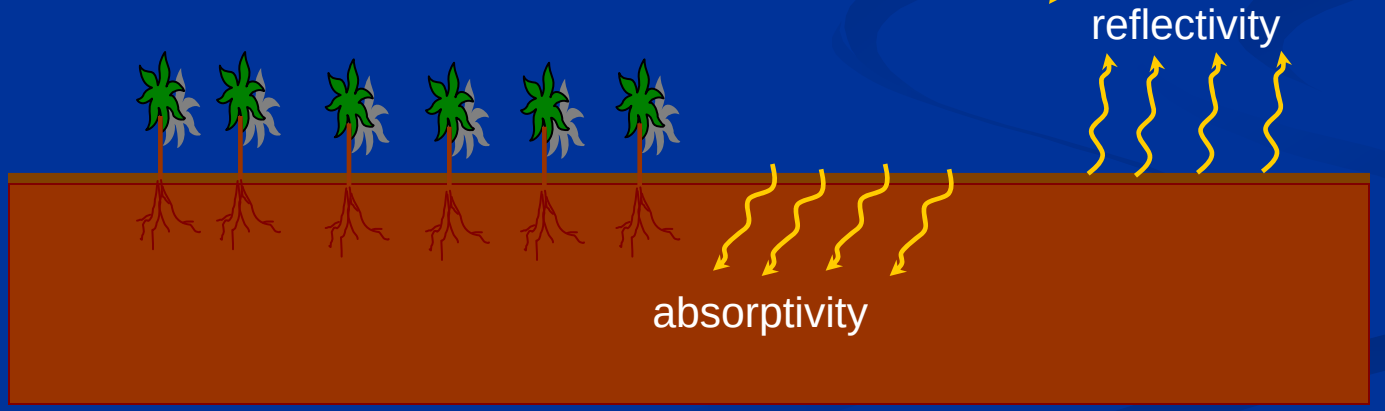


Biomass
(lb/ac)
Rye 4,607
Wheat 3,287

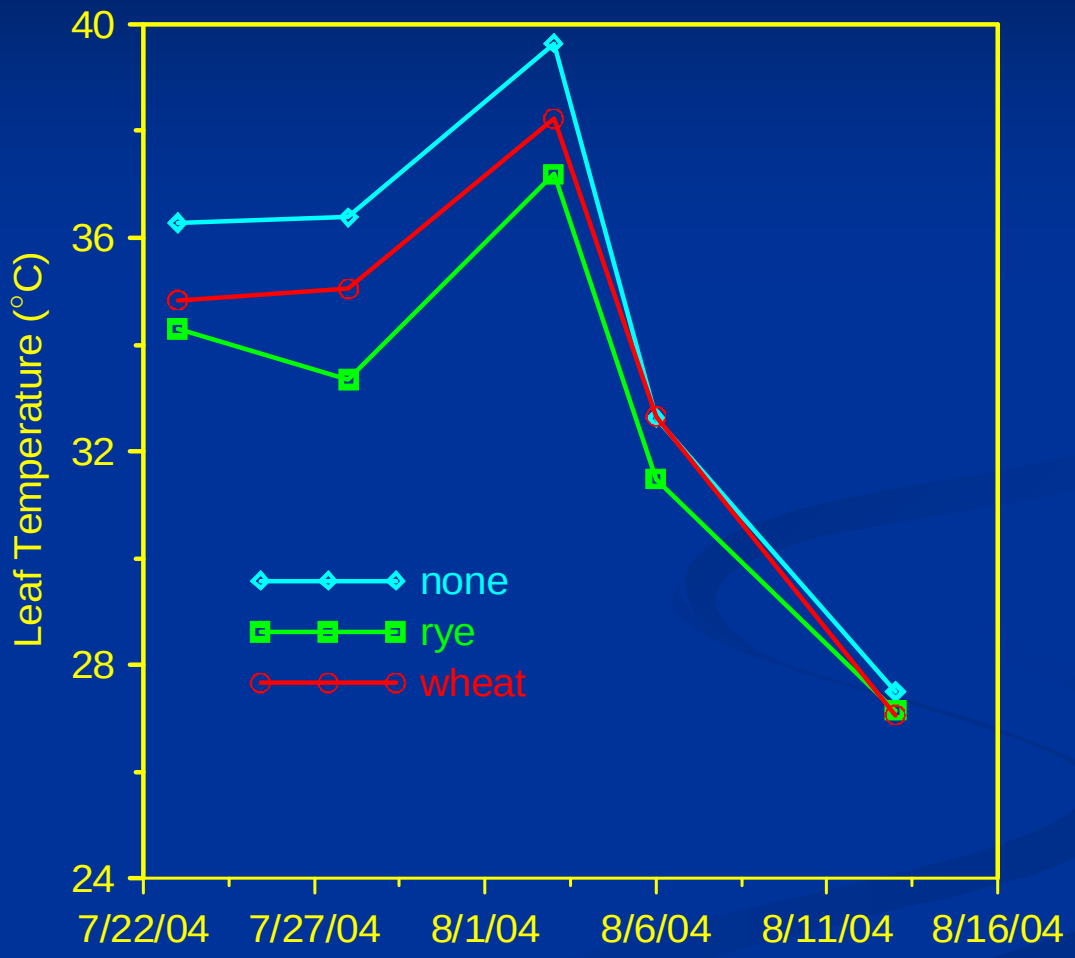
Where did the water come from?

- Winter cover crop:
  - Root channels; increased infiltration.
  - Mulch effect; reduced crusting.
  - Mulch effect; reduced ET.

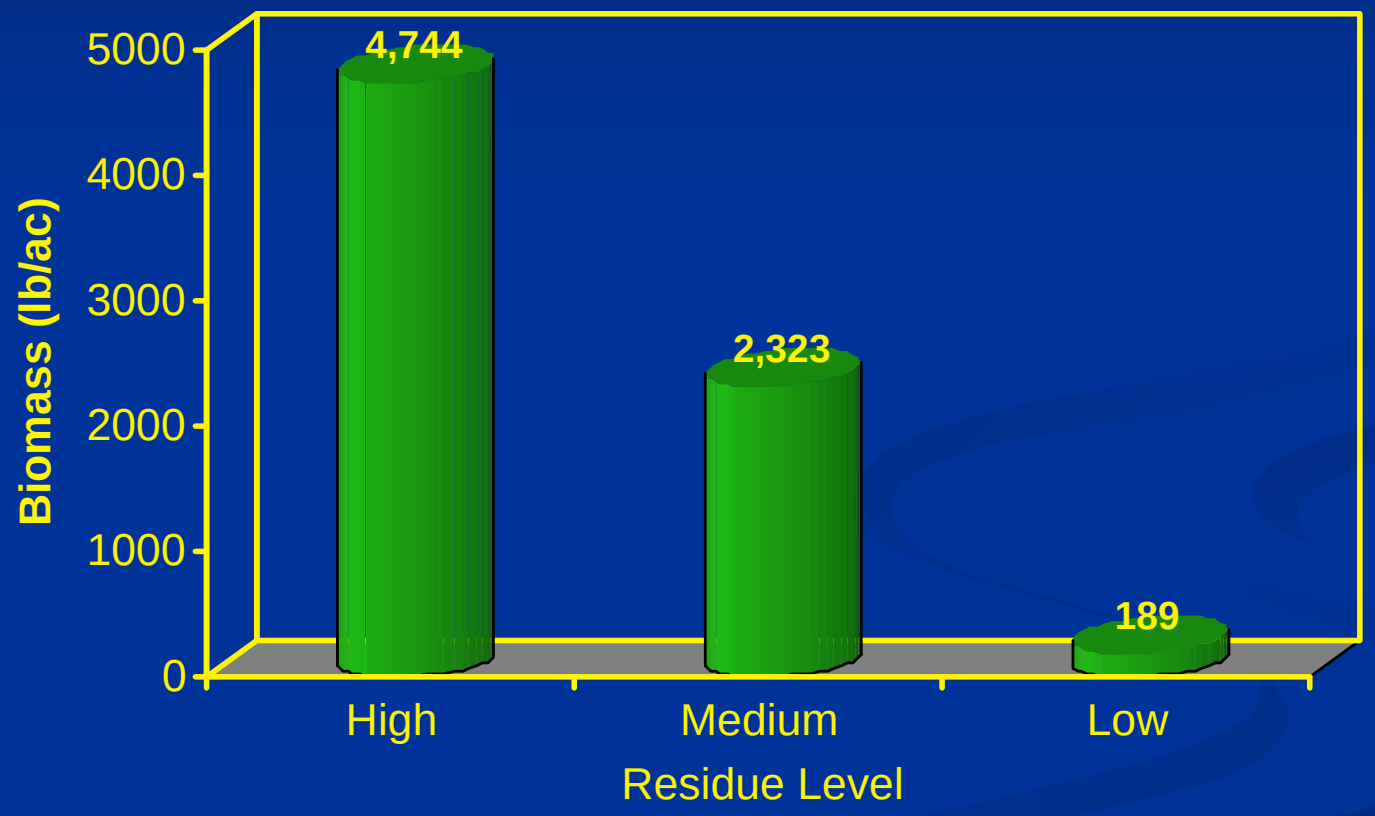
Mulch – Reduced ET



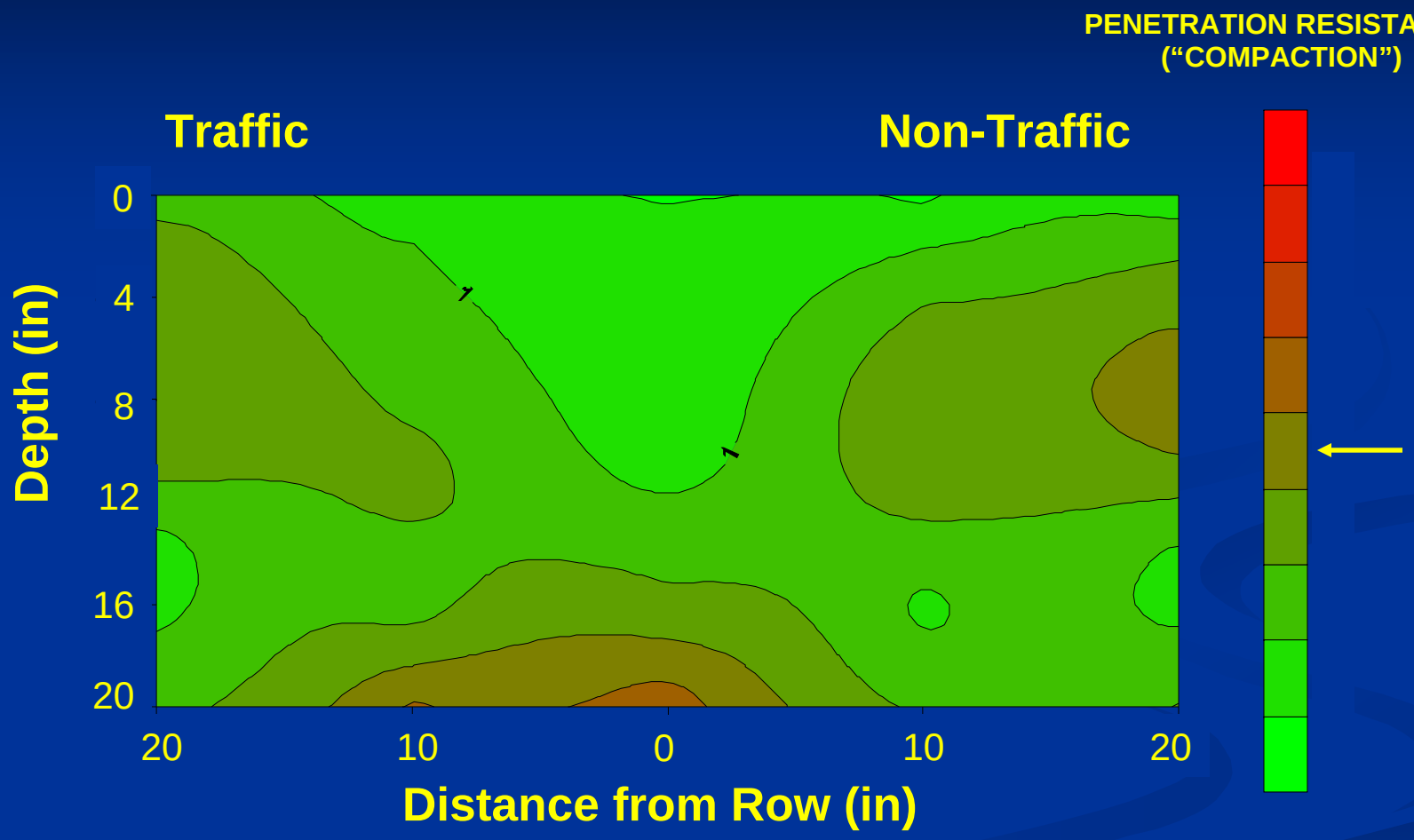
Leaf Temperature-Cover Crop



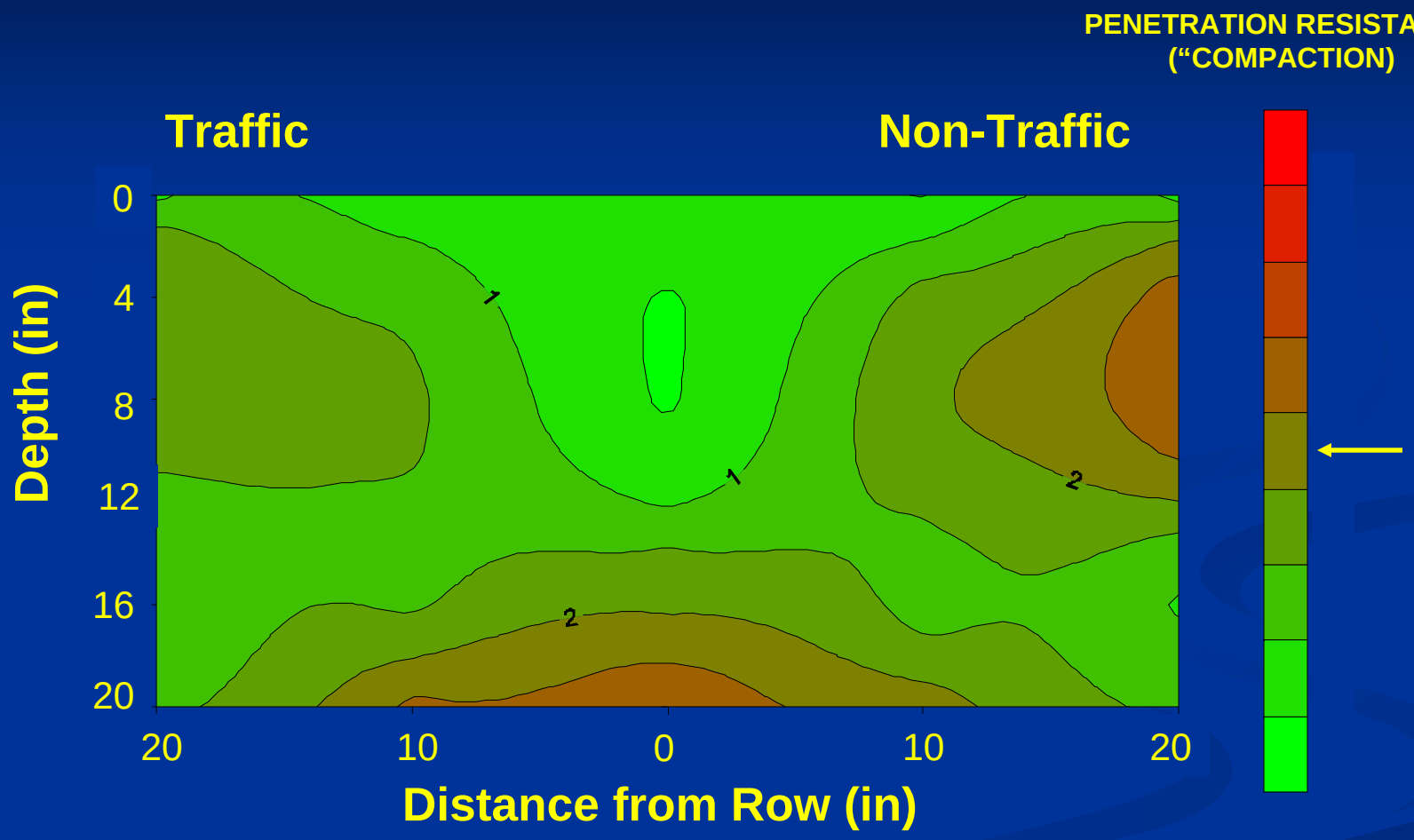
Rye Biomass Amount



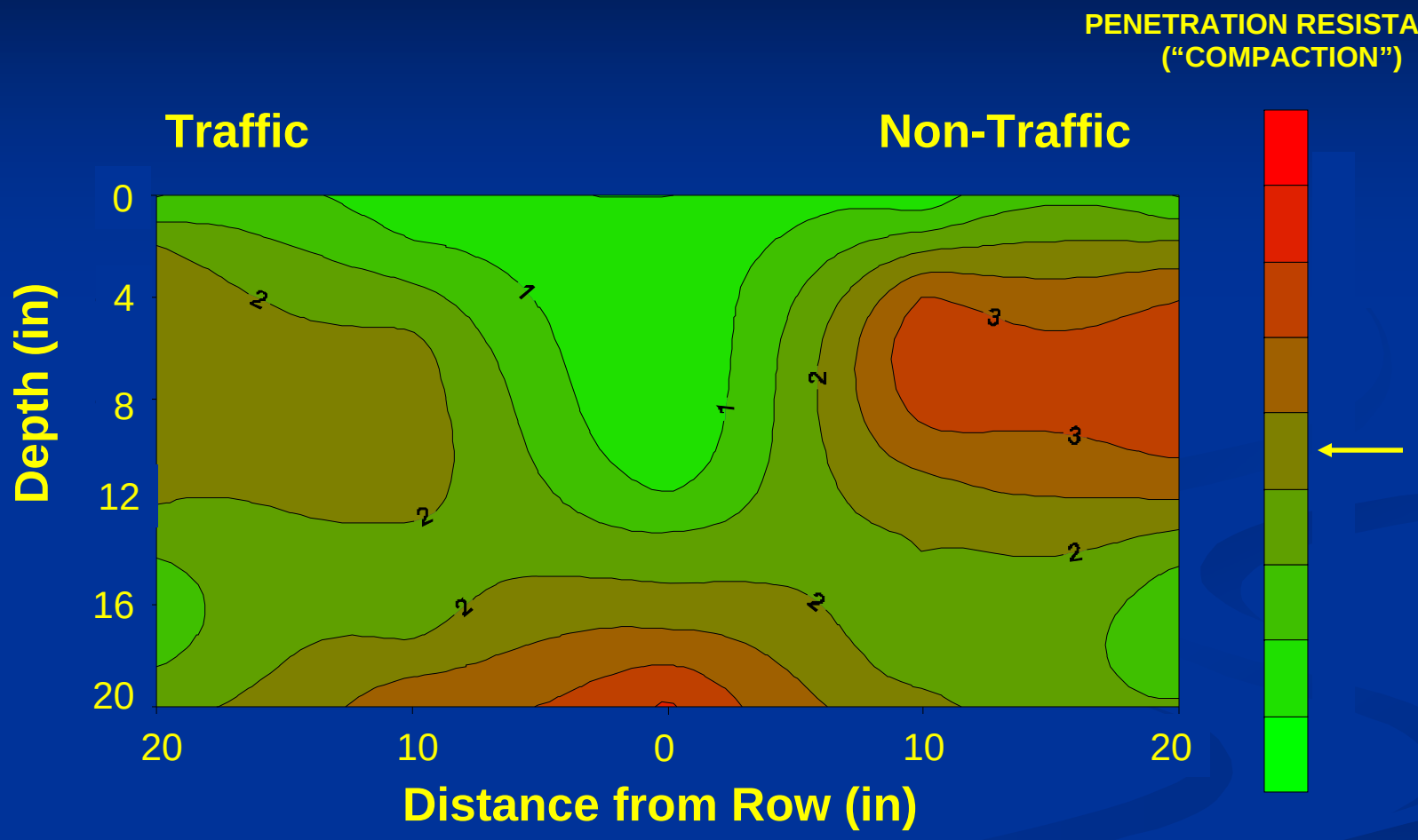
High Residue



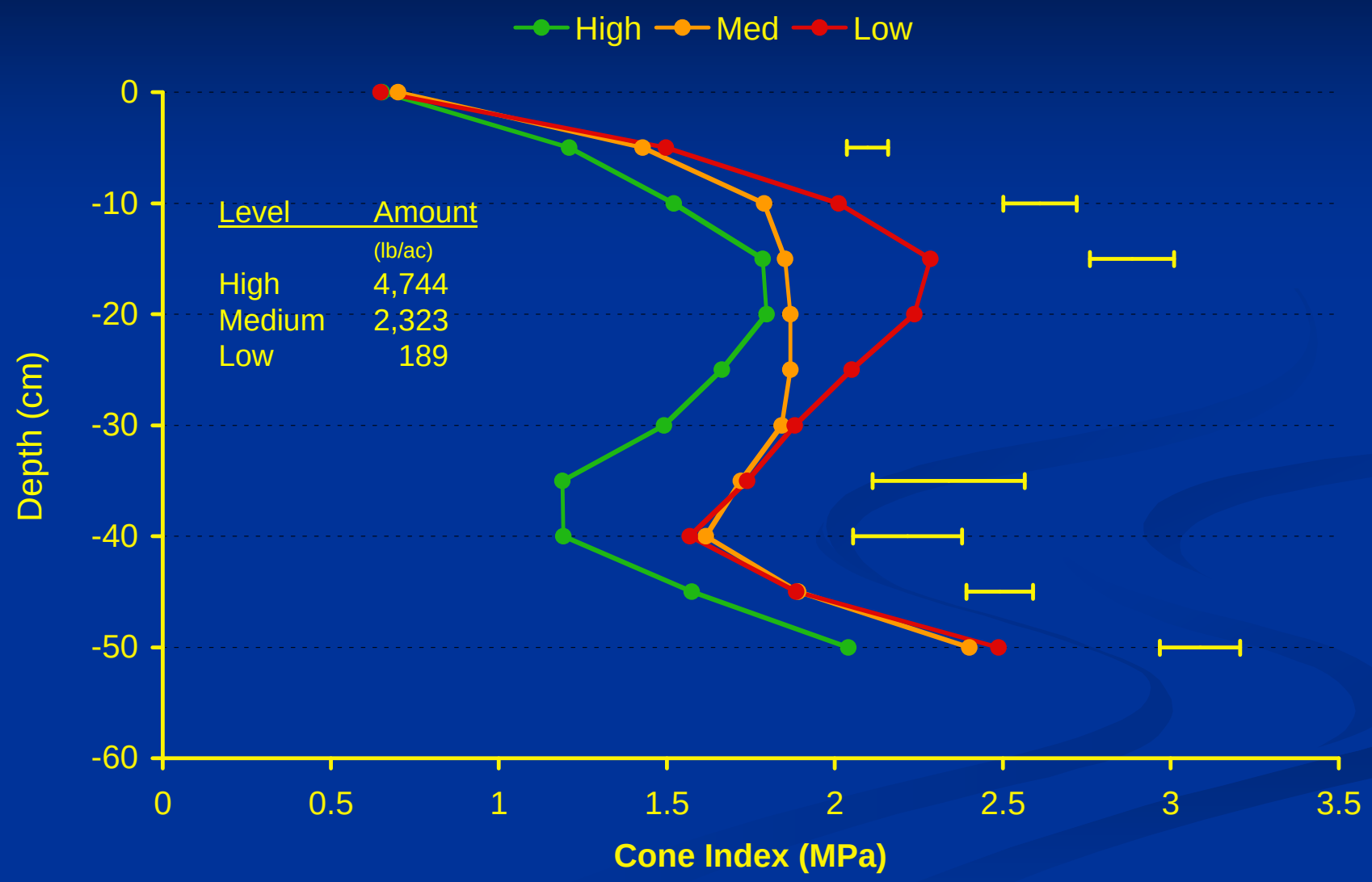
Medium Residue



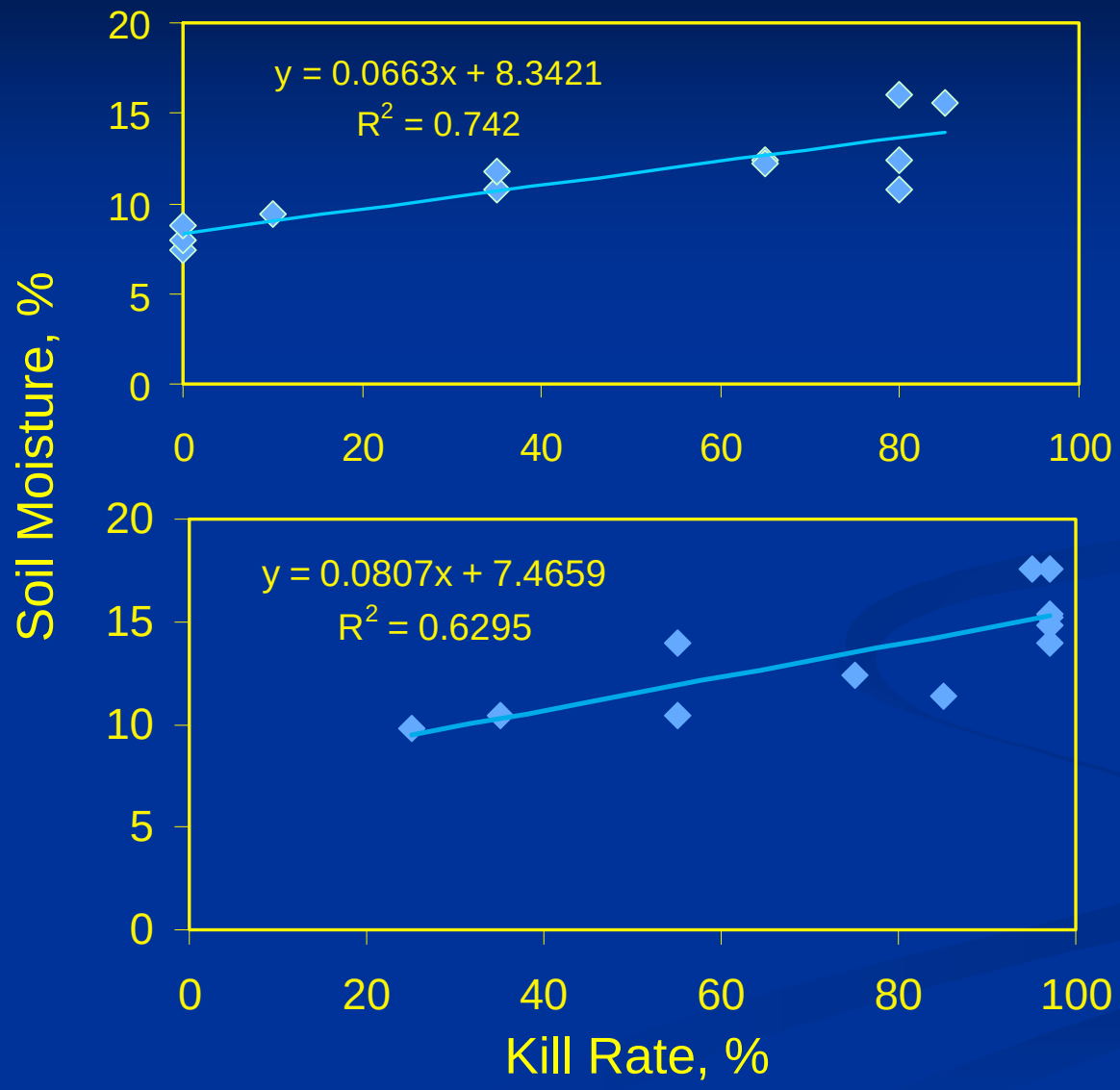
Low Residue


PENETRATION RESISTANCE
("COMPACTION")
Traffic
Non-Traffic
Depth (in)
0
4
8
12
16
20
20
10
0
10
20
Distance from Row (in)
1
2
3

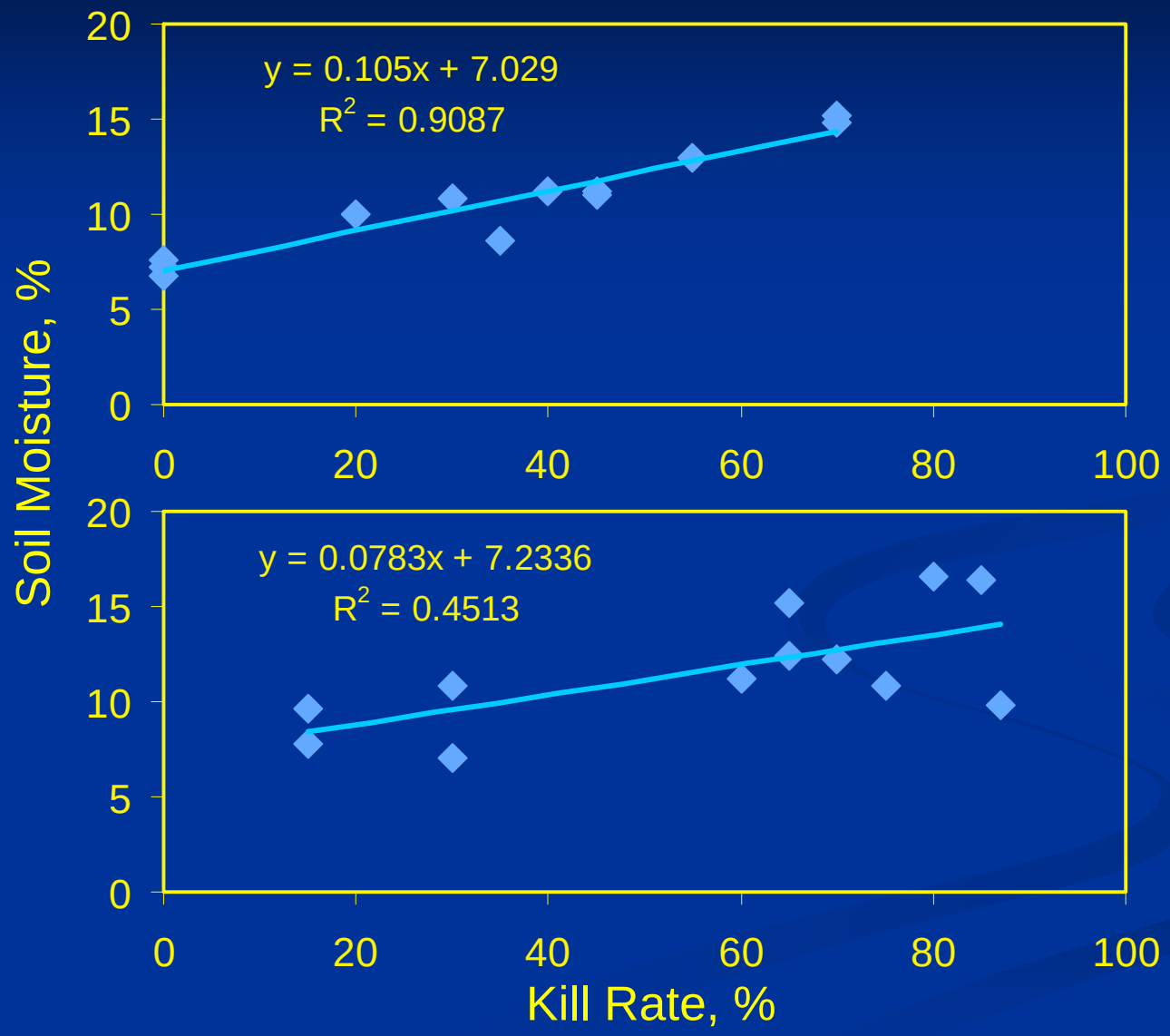
Penetration Resistance



Glyphosate Rate/Roller - RYE



Glyphosate Rate/Roller - WHEAT



Not Rolled

Rolled

Summary

- Reduced tillage or no-till:
  - Minimizes soil carbon losses.
  - Lessens impact of compacted layers, if present.
- Reside management (cover crops):
  - Protect soil from erosion.
  - Increase carbon returns to soil.
  - Weed management.