

4th Annual
Midwest Soil Improvement Symposium:
 2014
Research and Practical Insights into Using Gypsum

**Impact of Gypsum on Crusting,
 Seedling Emergence and Aluminum Toxicity**

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**Impact of gypsum on crusting,
 seedling emergence and
 aluminum toxicity**

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AGENDA

To talk about our experiences using gypsum

Why we are working with gypsum

What we are doing

Some results

Arkansas

Size: About 53,000 sq. Mi



Corn:	500,000
Sorghum	150,000
Cotton	400,000
Rice	1,300,000
Soybean	3,500,000
Wheat	500,000



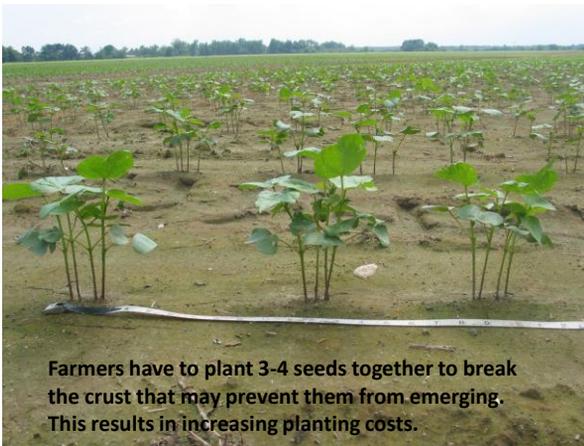
Soil testing is free
\$2.5 tonnage fee
225,000 samples per year
80% of samples taken for VRT



Alluvial soils

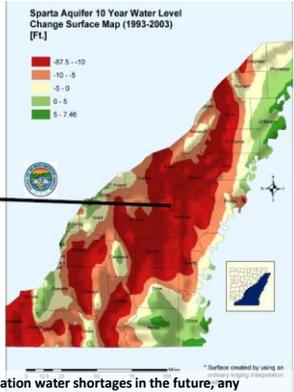


Most of our soils have on average 0.5% organic matter
Many of our soils are 70% silt !



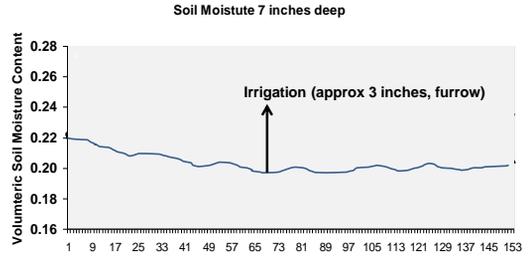
Declining Groundwater

As much as 100 ft



The Delta region will experience irrigation water shortages in the future, any practice that results on increasing water use efficiency will be adopted.

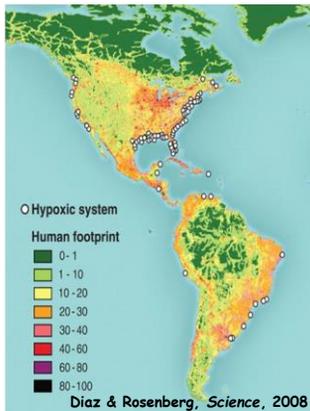
Soil Crusting Reduces Water Infiltration



Arkansas is ranked 4th in contribution of N and P to the Hypoxia in the Gulf of Mexico



Hypoxic Zones



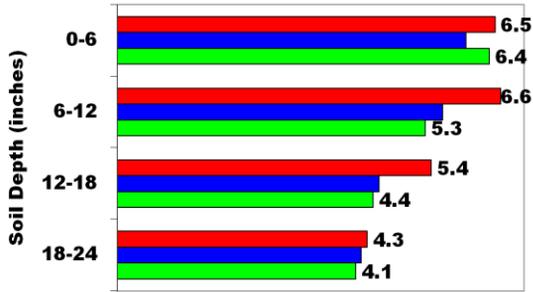
Fragipan



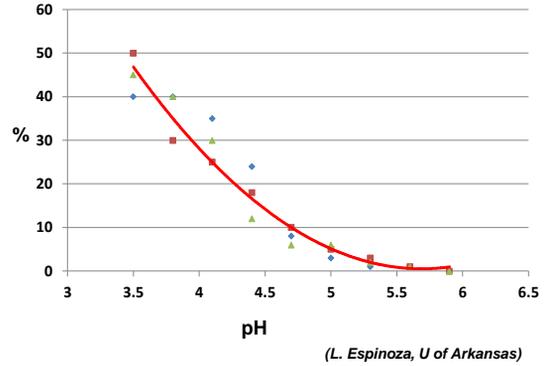
→ Fragipan

A Fragipan is a subsoil diagnostic horizon found 12-18 inches deep with high aluminum concentration and very low soil pH,

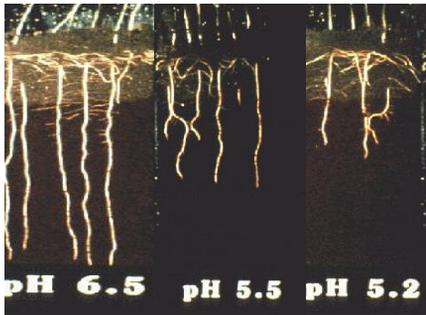
pH Stratification with Soil Depth



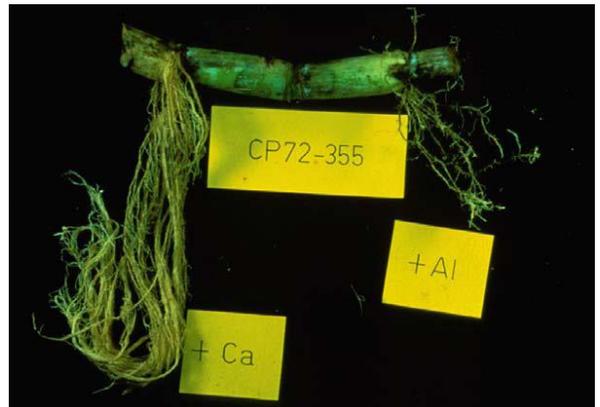
Aluminum Solubility and Soil pH



Effect of Aluminum on Roots

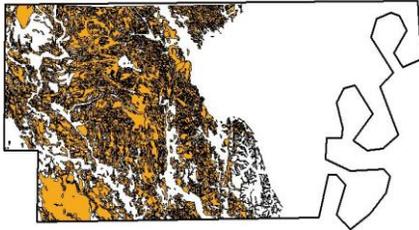


Source: Clemson Univ., 1999.



(D. Anderson, U of FL)

**Fragipans in Lee County, AR
(around 150,000 acres)**



Why are we working with gypsum ?

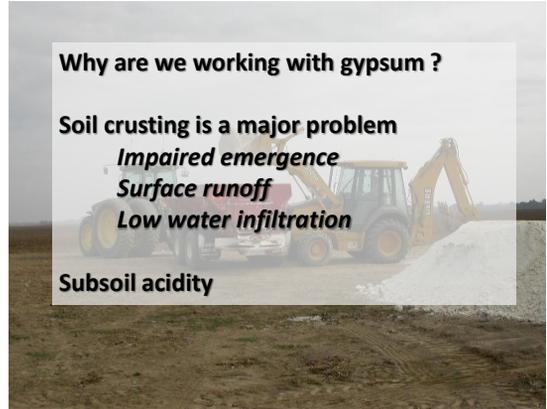
Soil crusting is a major problem

Impaired emergence

Surface runoff

Low water infiltration

Subsoil acidity



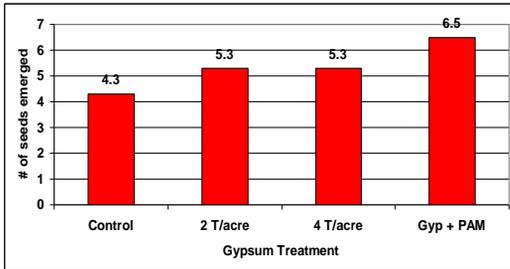
So, what have we done ?



ly using rainfall simulators to assess the effect of gypsum on emergence



Cotton Seedling Emergence Based on Treatment



Study Site (60 acres)



Treatments

- I. 0 T/a
- II. 1 T/a
- II. 2 T/a

1 T/a = 900 kg/ 4047 M²

Treatments

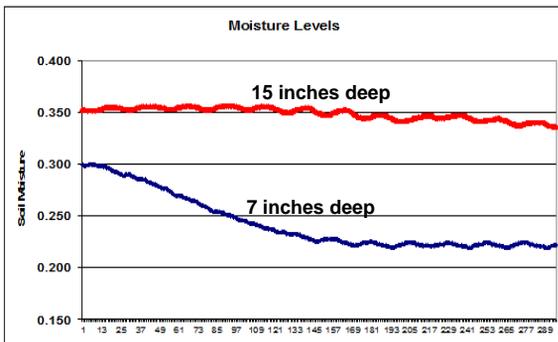
Were replicated 3 times

Plots

500 ft x 28 rows 38-inch

Typic Fragiaqualfs Henry

Soil Moisture Levels in a Fragipan

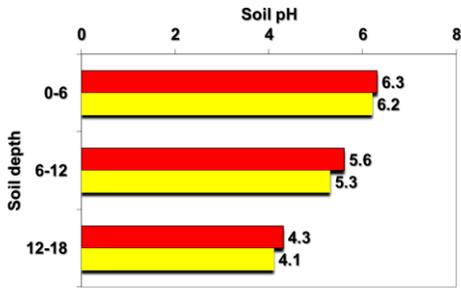


Demonstration Sites

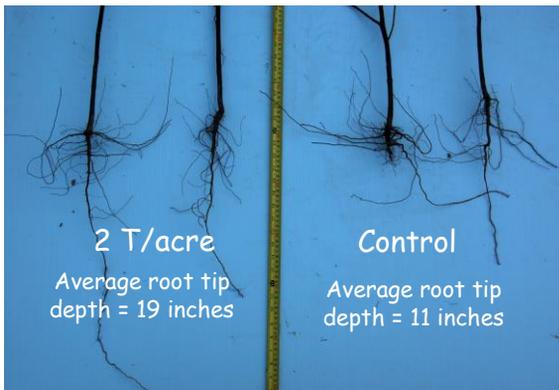
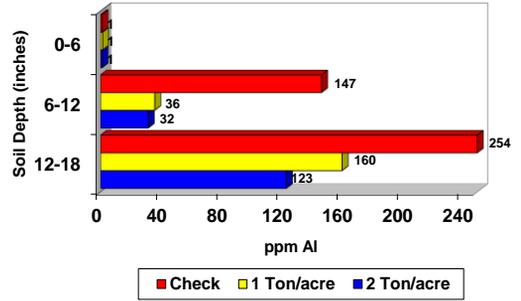


Sensors installed 5 inches and 15 inches deeps in soil layers

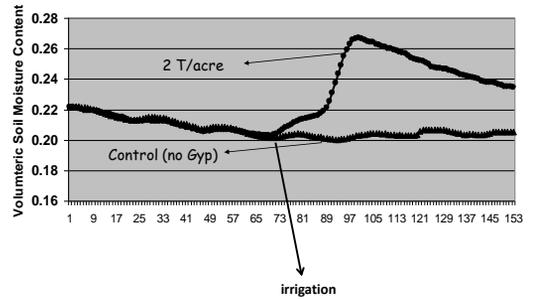
Soil pH Stratification

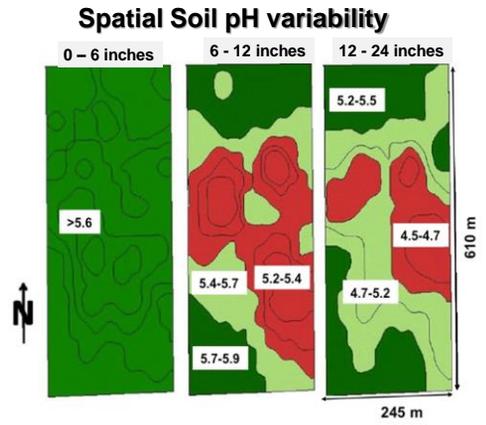
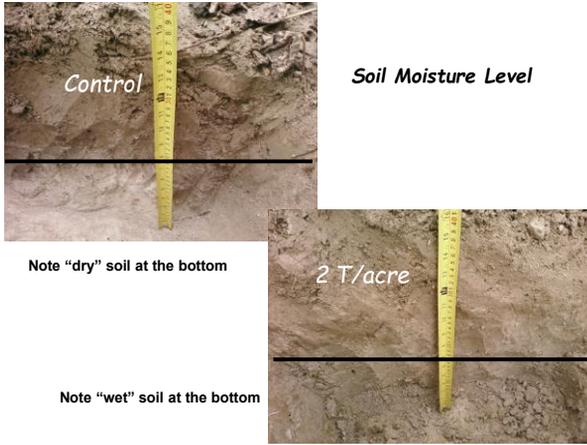


Effect of Gypsum on Exchangeable Aluminum

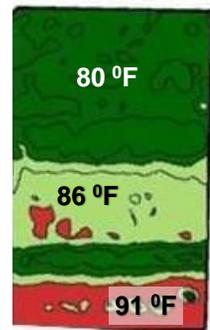


Soil Crusting Reduces Water Infiltration





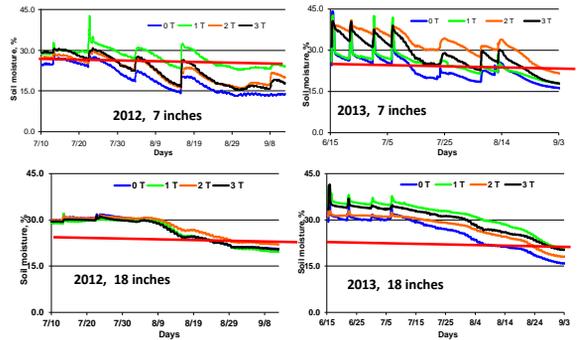
Temperature Gradient in a 40 acre field recently irrigated



Gypsum – Irrigation Studies (Lon Mann Station)

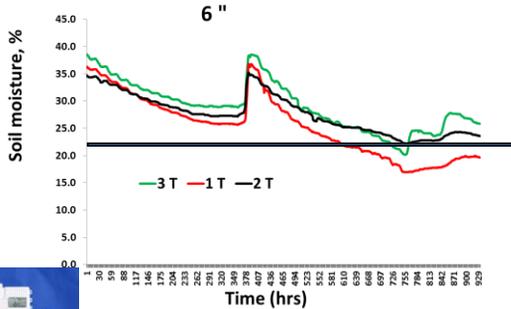


Effect of FG-Gypsum on Water Infiltration

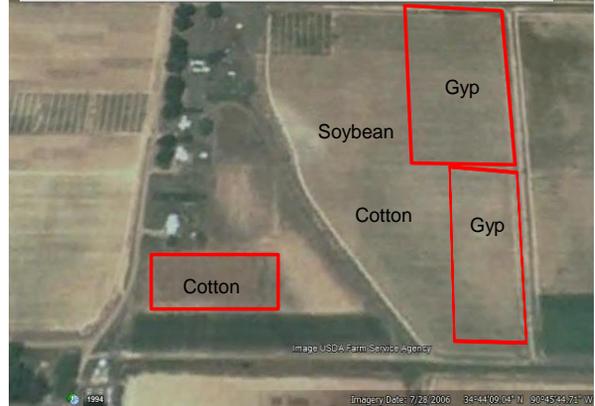


Small plot research showing the beneficial effect of gypsum on water infiltration During the second year of application. Water sensors were placed at 7 and 18 inches deep.

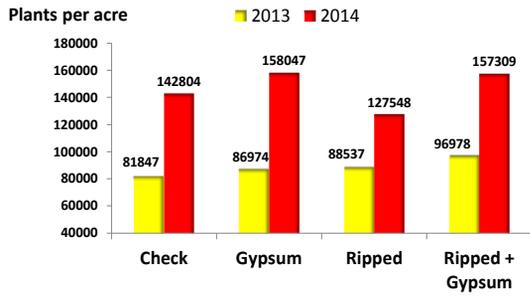
Soil Moisture Trends in Plots with Varying annual applications of Gypsum



Gypsum – Irrigation Studies (Lon Mann Station)



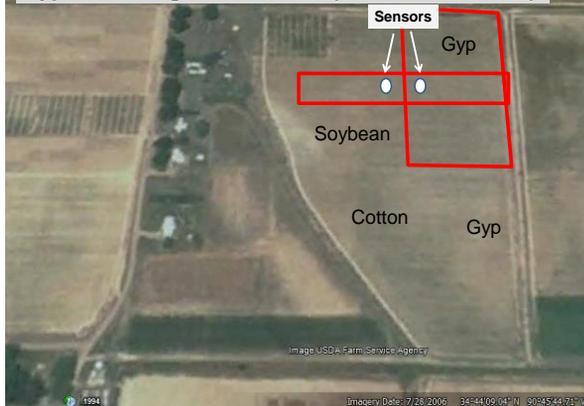
Soybean Stand Establishment According to Treatment



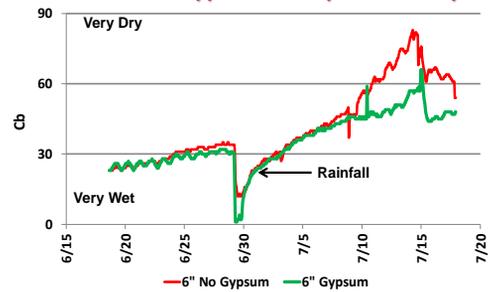
(Dr. P. Francis, UAM)



Gypsum – Irrigation Studies (Lon Mann Station)



Soil Moisture Trends in Plots with and without Gypsum in Soybean Study





Summary

Thanks!

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