

Conservation Tillage Boost from Perennial Grasses

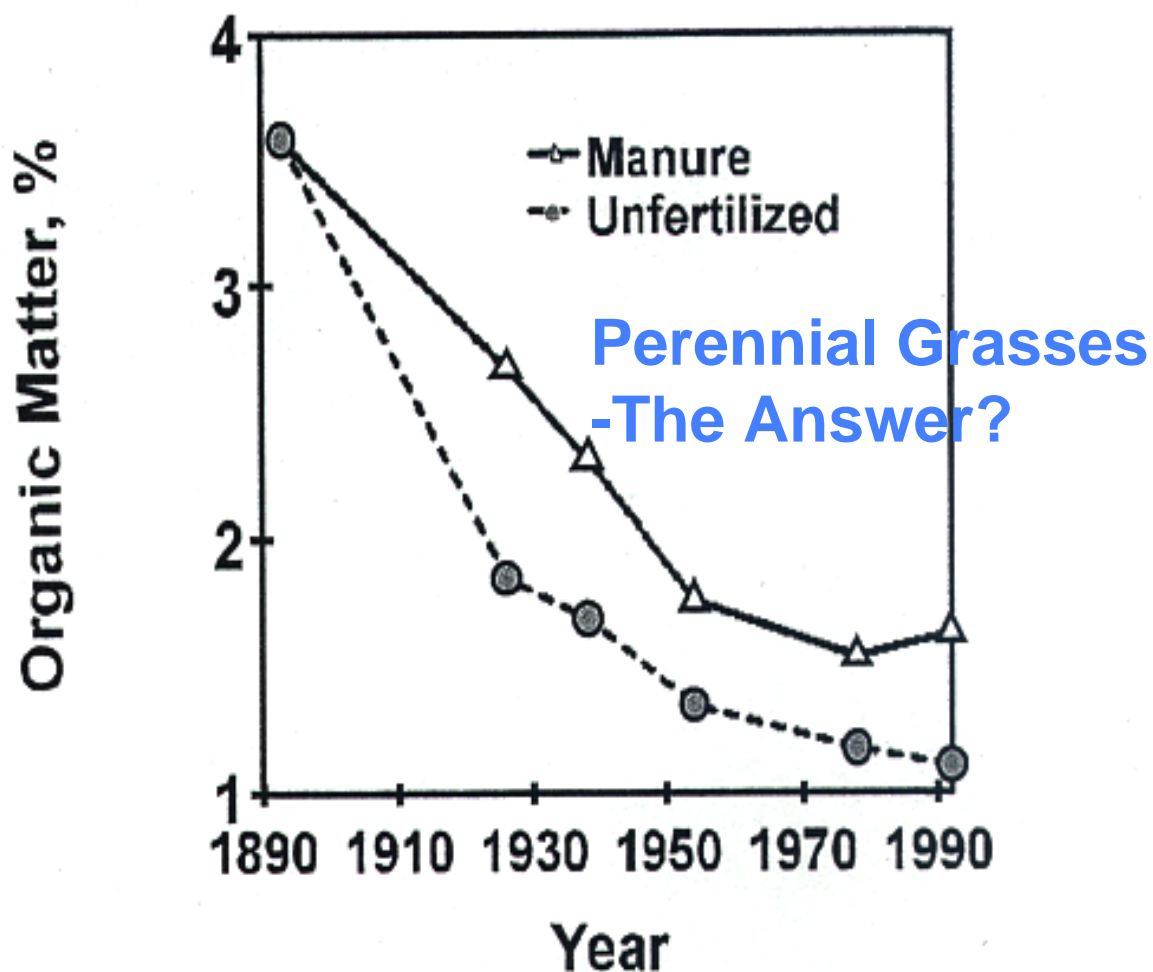
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History of Conservation Tillage in SE

- No-till was tried in the 60's with limited success due to natural compaction layer of Coastal Plains soils
- In row subsoiling began for conventional farming in the early to mid 70's to break the compaction layer and added 20-50 bu/A corn and 5-15 bu/A soybeans
- No-till plus in-row subsoiling began with equipment development in the late 70's and early 80's (first conference held in 1978 in Griffin, GA)
- Herbicide programs for strip tillage were developed in the early and mid 80's
- Equipment and hooded sprayers were refined in late 80's and early to mid 90's
- Roundup Ready crops came on the scene in the mid to late 90's
- Research focused on improving crop yield of conservation tillage as compared to conventional by increasing biomass of cover crops, etc. , 90's to present
- Tri- state study (late 90's to present) incorporating perennial grasses in rotation with row crops using conservation tillage to improve yield, soil OM and water quality, economics, and risk management of the farm and utilizing farm resources year round while decreasing pests (nematodes, insect, disease) and inputs

Changes in Soil Organic Matter Magruder Plots, OK



Sod based rotation “the next step after conservation tillage” is based on the value of perennial grasses and benefit to soil health and crop yield

The Rotations

1. **BAHIAGRASS-BAHIAGRASS-PEANUT-COTTON** (Winter annuals for grazing after crops)
2. **COTTON-COTTON-PEANUT** (Winter annuals after each crop)

Conservation tillage has been used each year with best management practices in both rotations

2 year old bahia

Peanut

1st year bahia

Cotton

The Rotation- September

Perennial grasses in rotation with row crops will make more difference in relation to soil health, OM, yield, water quality, risk management, and farm economics than converting from conventional to conservation tillage or using other technology

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**All crops planted using conservation tillage
and no-till for winter annuals and bahiagrass**

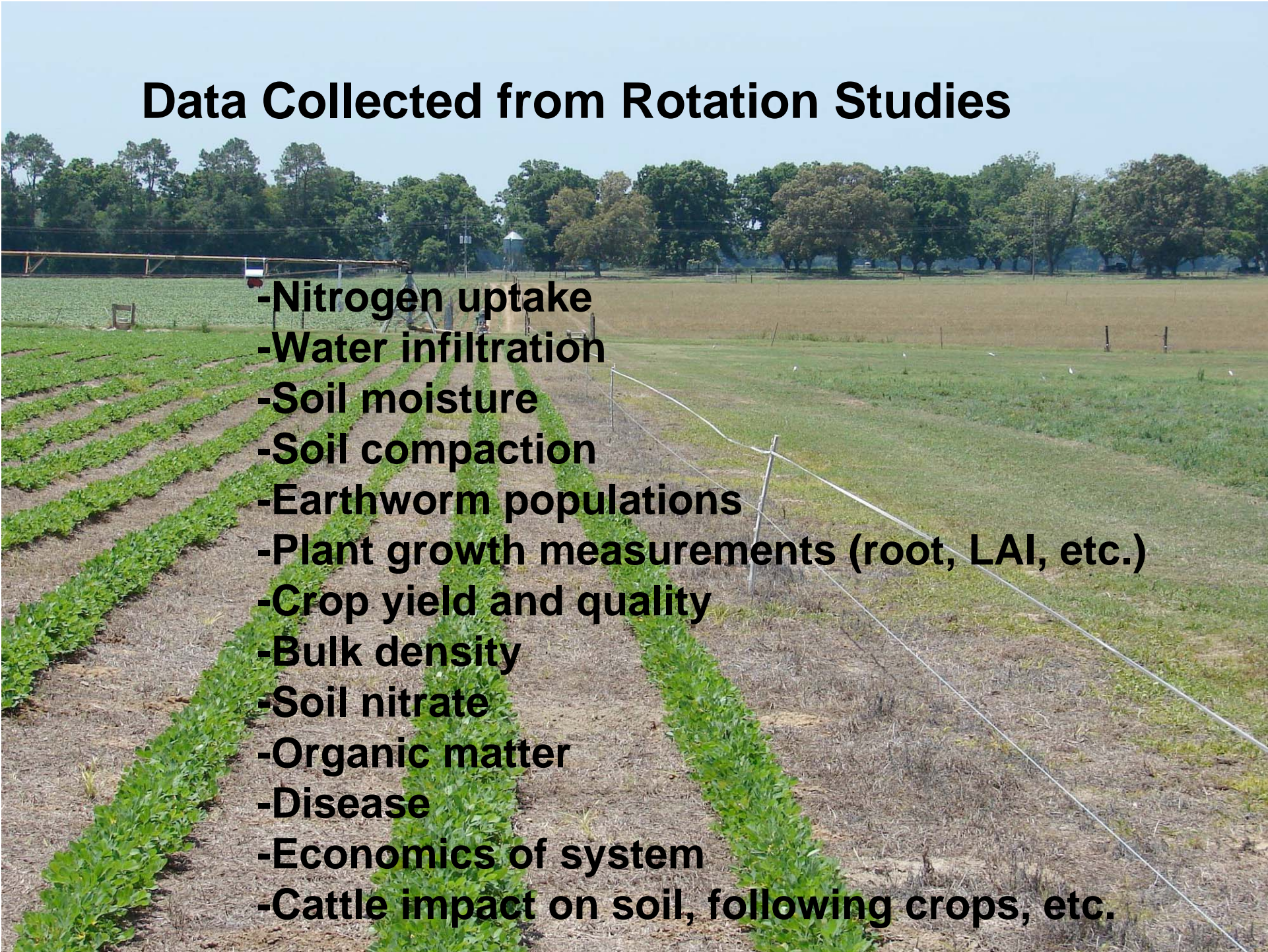


Strip Till Planting Peanut into Bahiagrass



2/3rds of the biomass of perennial grasses is below ground as compared to 1/3rd of annual crops.

Data Collected from Rotation Studies

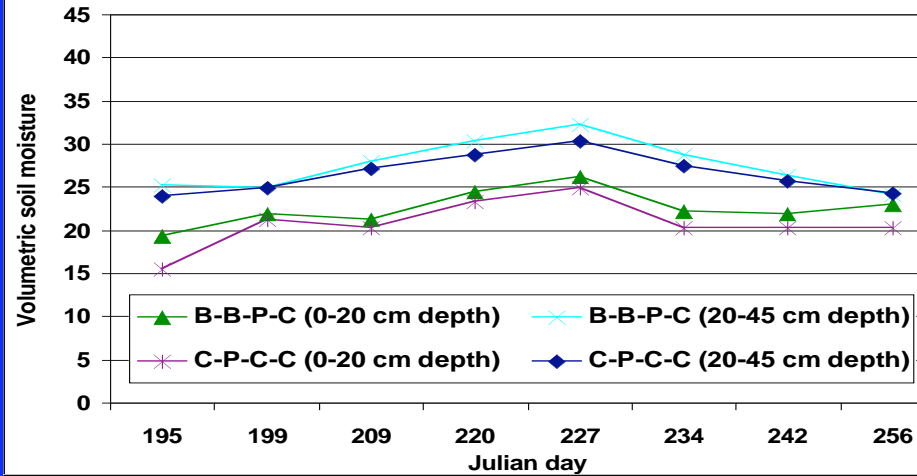
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- Nitrogen uptake
 - Water infiltration
 - Soil moisture
 - Soil compaction
 - Earthworm populations
 - Plant growth measurements (root, LAI, etc.)
 - Crop yield and quality
 - Bulk density
 - Soil nitrate
 - Organic matter
 - Disease
 - Economics of system
 - Cattle impact on soil, following crops, etc.



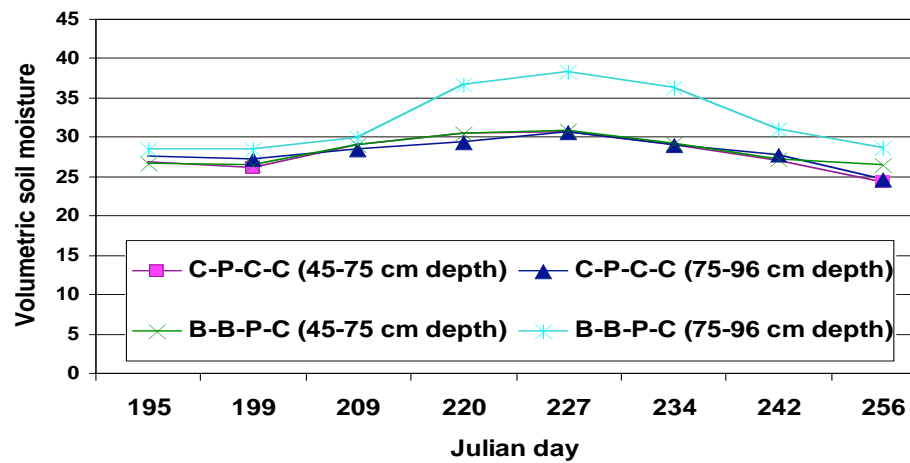
Earthworm castings



Volumetric soil moisture for two crop rotations at two depths at Quincy, FL. in 2003.



Volumetric soil moisture for two crop rotations at two depths in Quincy, FL. in 2003.

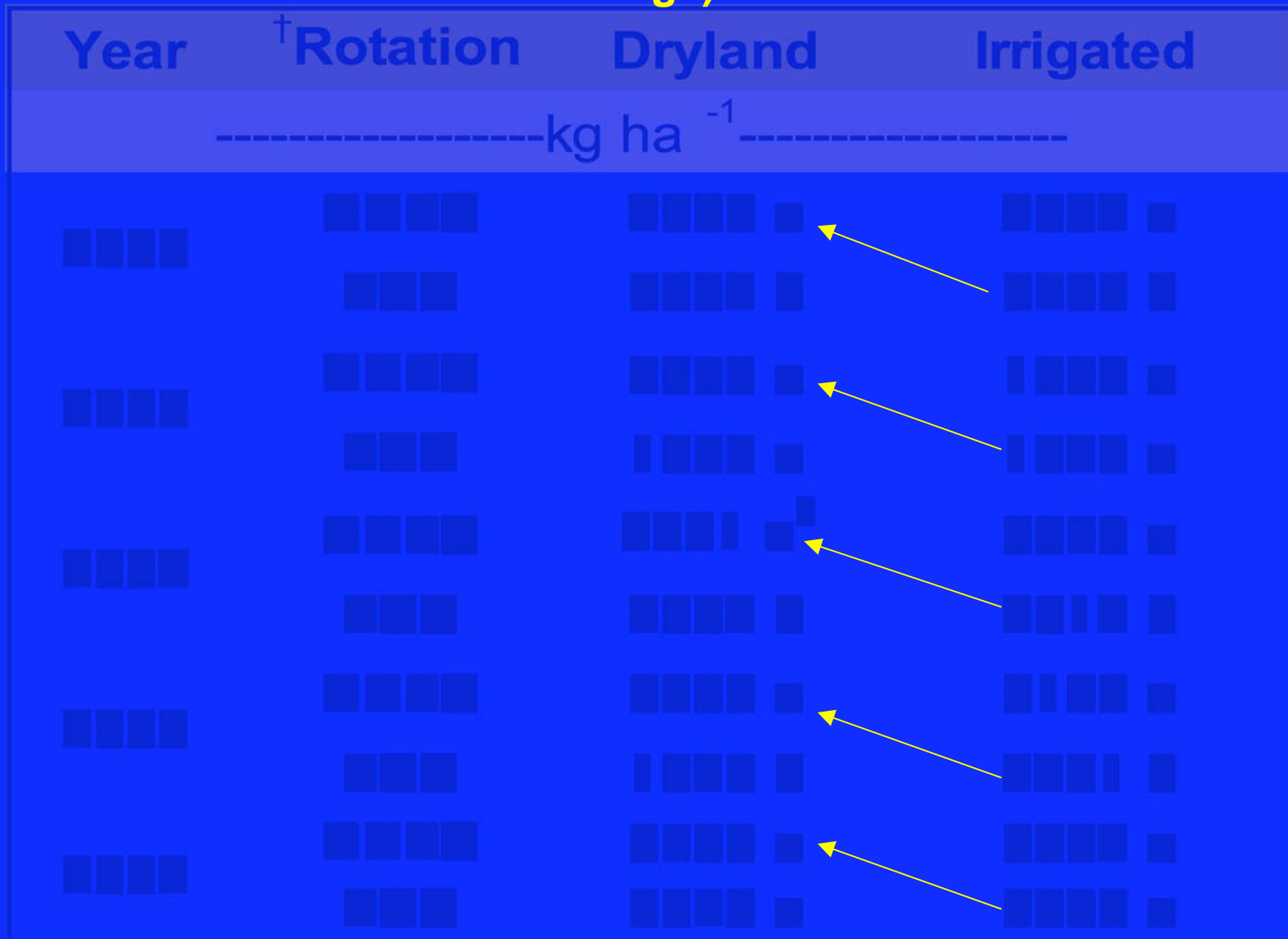


Julian day 160 corresponds to June 9, 240 to August 28, and 300 to October 27

Effects of bahiagrass kill time and tillage on peanut yield (lbs acre⁻¹) at Marianna and Quincy, Florida in 2006 .

Tillage	Marianna			Quincy [†]		
	Fall kill	Spring kill	Mean	Fall kill	Spring kill	Mean
Strip till	4078 a [‡]	4499 a	4289 a	3776 ab	4441 ab	4109 ab
Disk+turned	4115 a	3806 b	3960 a	4516 a	4369 ab	4442 a
Disk+chiseled	4331 a	4364 ab	4348 a	3731 ab	4697 a	4214 ab
Paratill+strip till	4353 a	4442 ab	4398 a	3983 ab	3508 b	3746 bc
Disk	4521 a	4316 ab	4420 a	4049 ab	3759 ab	3904 abc
Strip till+40 lb N	4187 a	4253 ab	4220 a	3285 b	3634 b	3465 c
0.05	1114	648	622	875	1023	650

Peanut yield for two crop rotations in FL
(dryland peanuts following bahiagrass averaged \$175 more/A than irrigated peanuts in the conventional rotation using conservation tillage)





**Peanuts grown in soil
without Bahia roots**

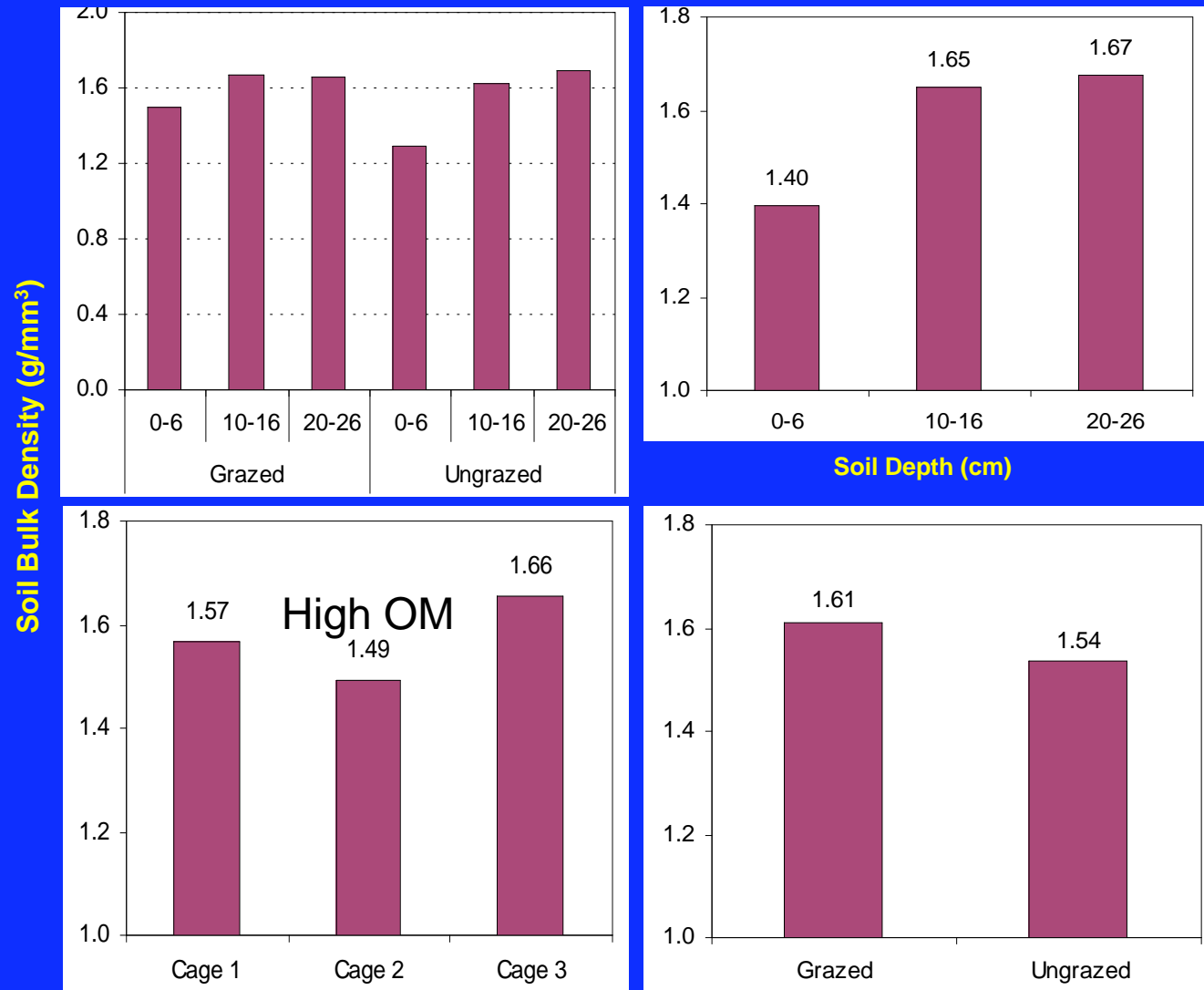
**Peanuts grown in soil
with Bahia roots**

Soil was the same cultivated soil in both cases with roots added



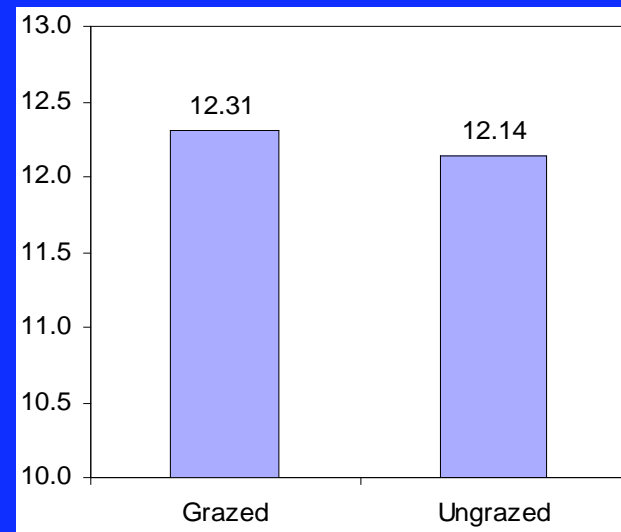
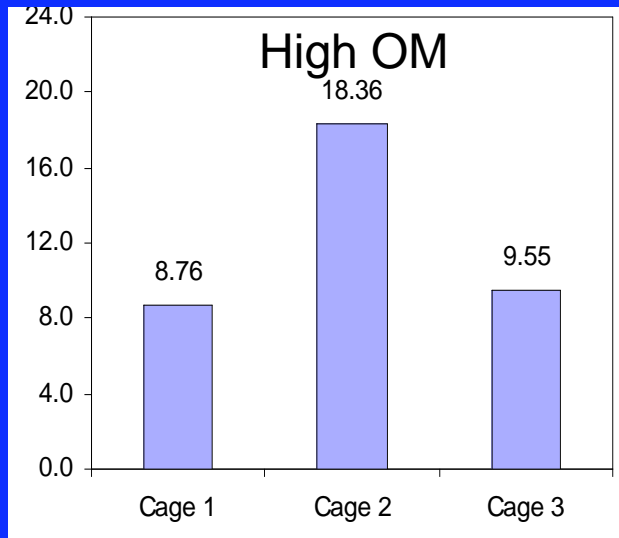
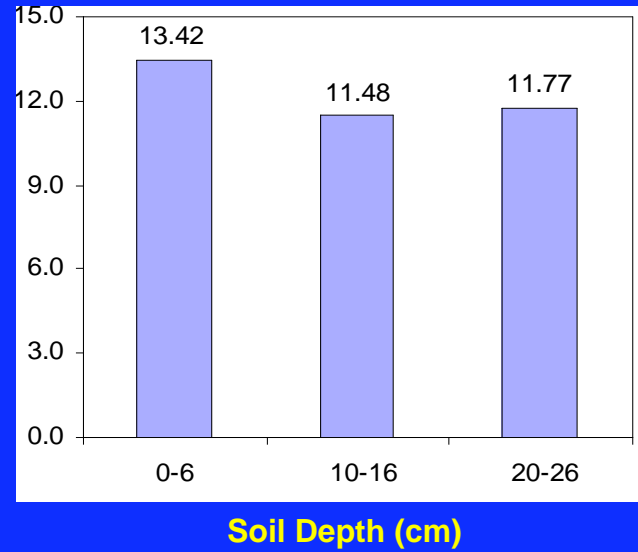
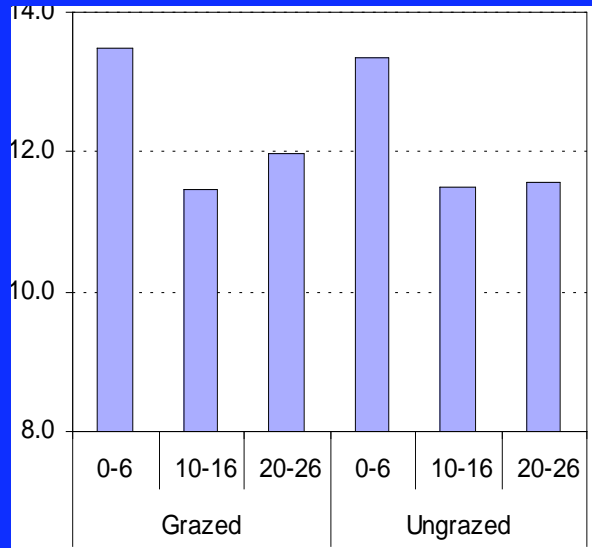
Marianna- exclusion cages
Winter grazing after cotton

Soil Bulk Density at Marianna



Soil Moisture at Marianna

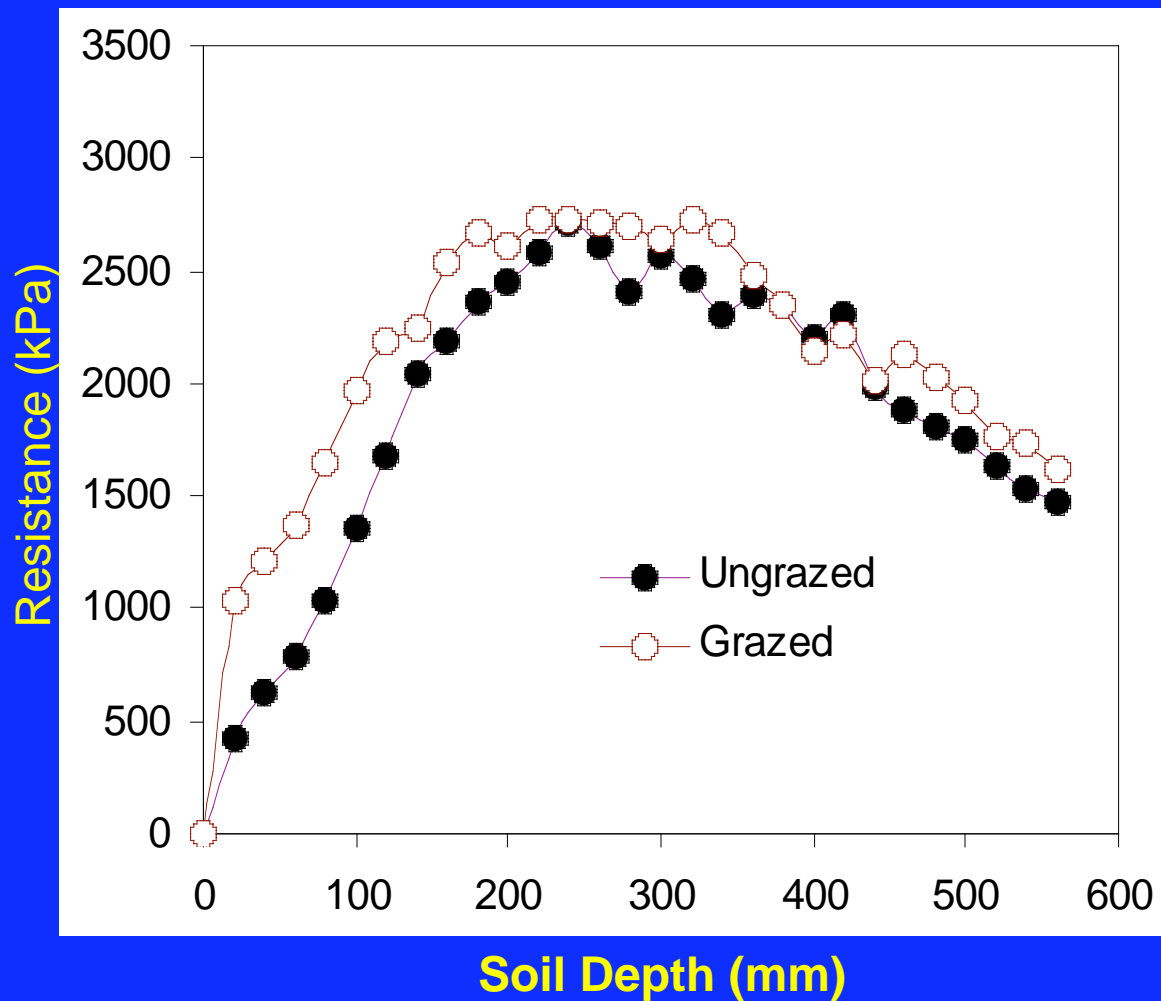
Soil Moisture (%)



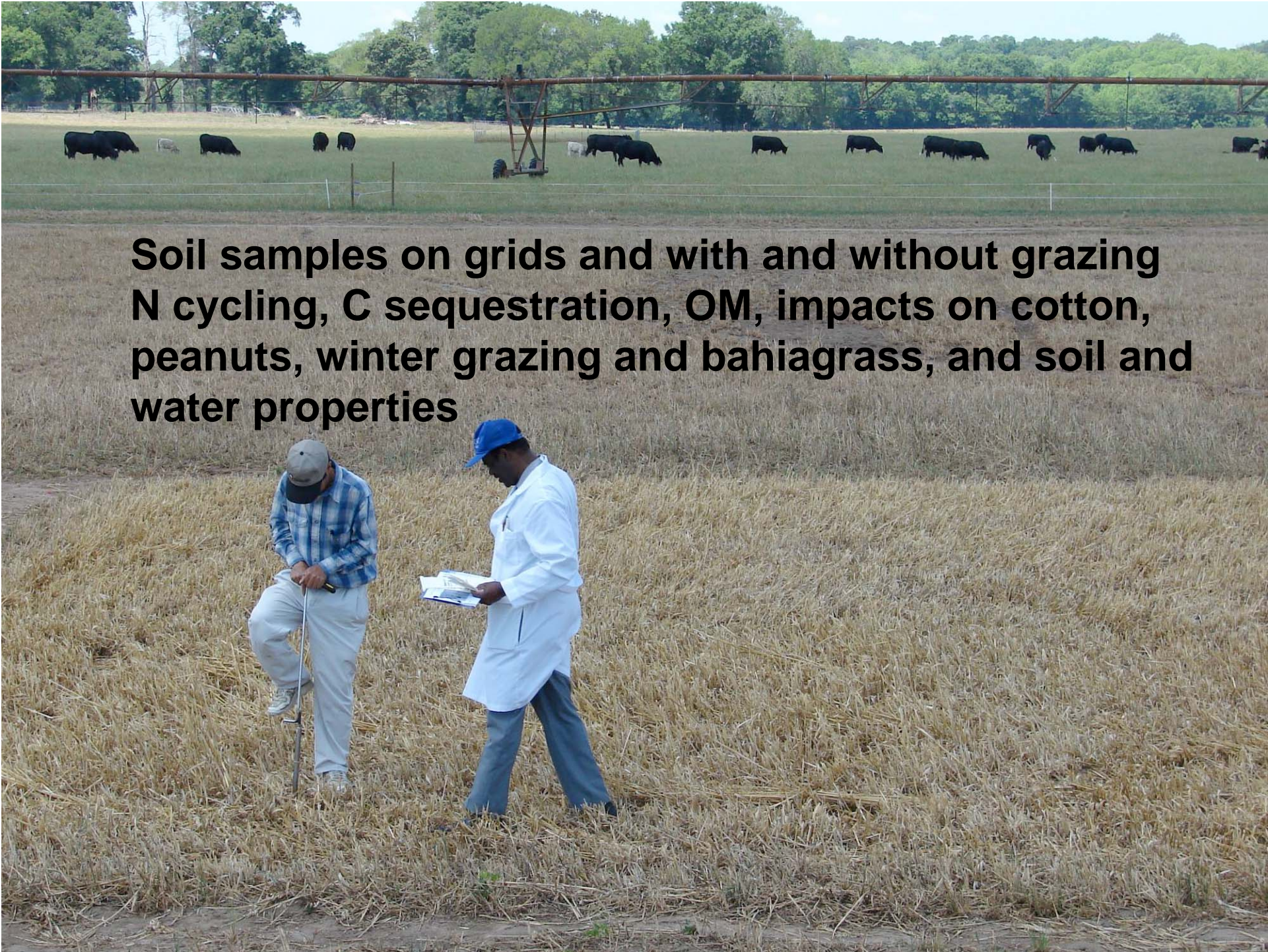


Grazing Effect on Soil Resistance

(Measured on 2-23-2007)



Each data point is the mean of 30 measurements from 3 replications.

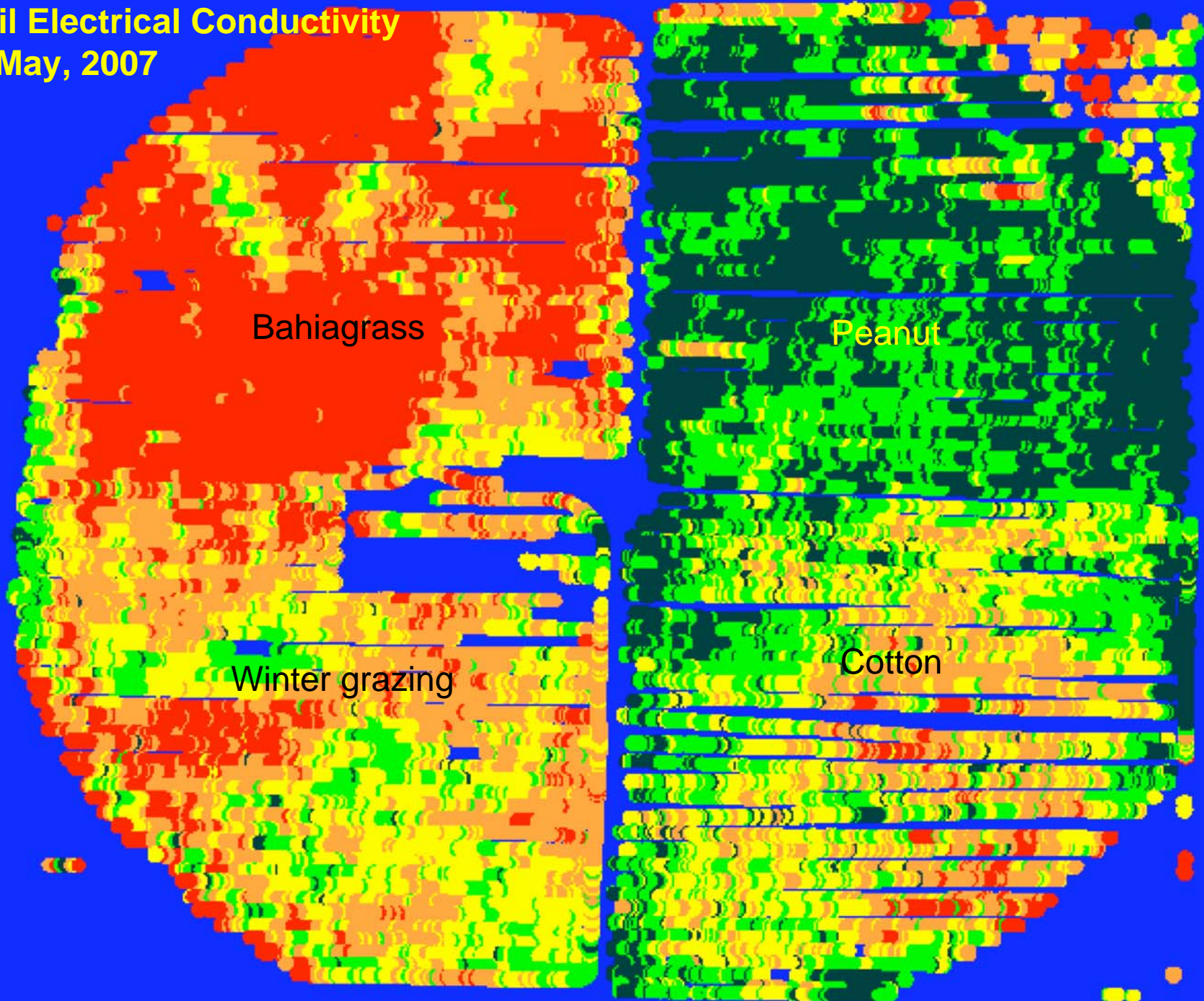


**Soil samples on grids and with and without grazing
N cycling, C sequestration, OM, impacts on cotton,
peanuts, winter grazing and bahiagrass, and soil and
water properties**

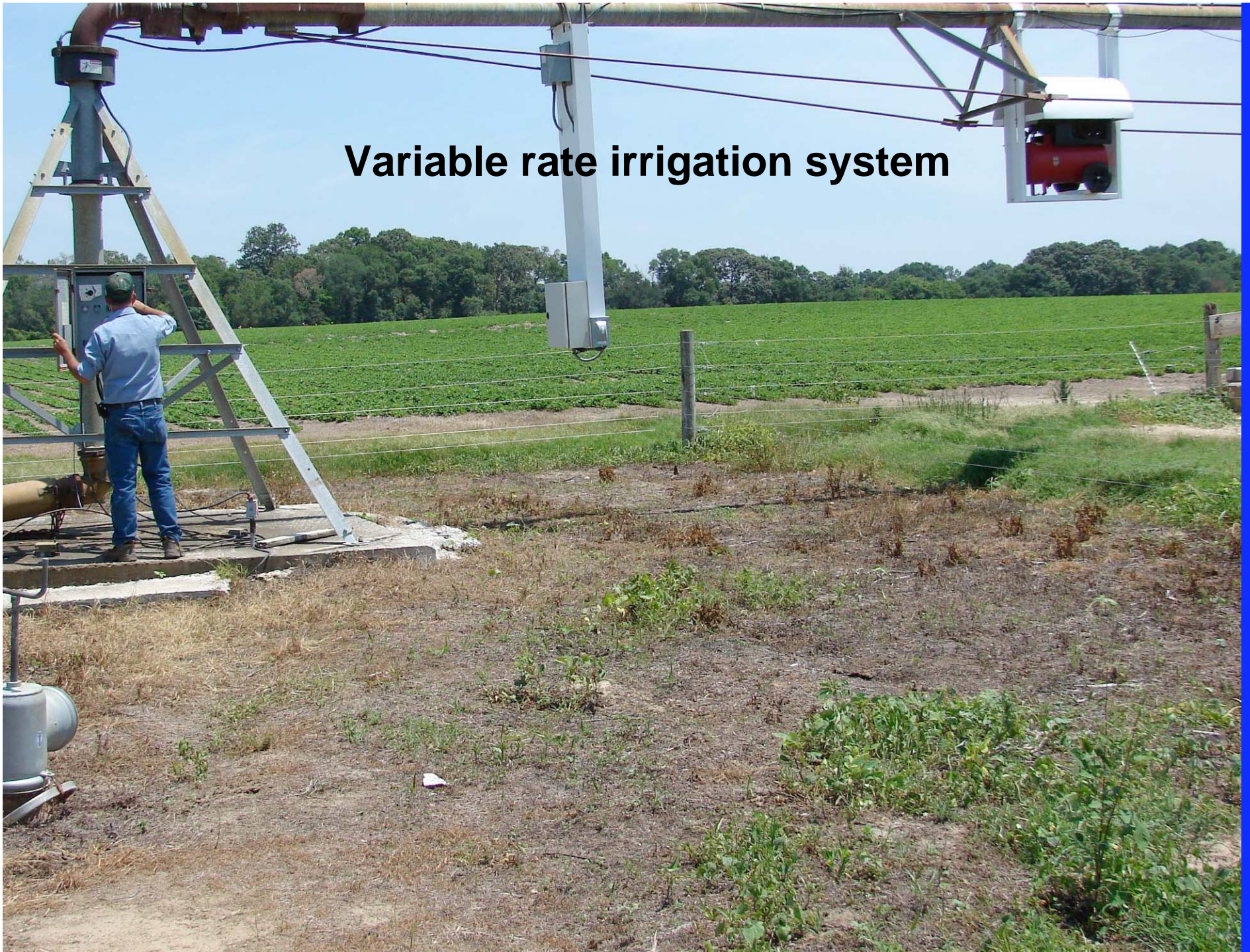




Soil Electrical Conductivity
In May, 2007



Variable rate irrigation system



Conventional Rotation 200 Acre Farm

<http://nfrec.ifas.ufl.edu/sodrotation.htm>

FIELD	CROP	YIELD/A	UNITS	ACRE	COSTS	RETURN	PROFIT
1	PEANUT	2500	lbs	50	22956	25000	2044
2	COTN	650	lbs	50	21175	22100	925
3	COTN	650	lbs	50	21175	22100	925
4	COTN	650	lbs	50	21175	22100	925
TOTAL				200	86481	91300	4819

Fourth Year in Sod Rotation

FIELD	CROP	YIELD/A	UNITS	ACRE	COSTS	RETURN	PROFIT
1	PEANUT	3750	lbs	50	22882	33150	10269
2	CATTLE	68	CALVES	50	24301	37500	13199
3	BAHIA 1	2	tons	50	12935	10000	-2935
4	COTN	975	lbs	50	22882	33150	10269
			TOTAL	200	90274	125331	35057

<http://nfrec.ifas.ufl.edu/sodrotation.htm>

Perennial Grass/Livestock in a Peanut/Cotton Rotation

- **It works! Perennial grass enhances conservation tillage**
- Reduces nematodes and diseases
- Increases water infiltration
- Increases yields (30-50% for peanut) and grades
- Increases biomass of roots and tops (deeper roots)
- Enhances soil quality (O.M., earthworms, etc.)
- Sequesters carbon
- Reduces risks by having alternate enterprises
- Reduces planting and harvest time with 1/2 acreage
- Cattle utilize forage year round and crop stubble
- Lowers soil mechanical resistance
- Must be committed to making it work
- 2-7 times more profitable




Highlighting the sod based system

Field Tour Wednesday, June 27, 2007, Marianna, FL

Sod based rotations have favorably influenced each of the factors measured over the best conservation tillage and cover crop management systems (Economics, water infiltration, earthworm numbers, soil moisture content, organic matter content, lower penetrometer and residual nitrogen content, enhanced plant growth, and reduced risks to the farm system. (Over 25 scientists involved)

<http://nfrec.ifas.ufl.edu/sodrotation.htm>



Feed Efficiency Facility



Installation of mini-rhizitrons

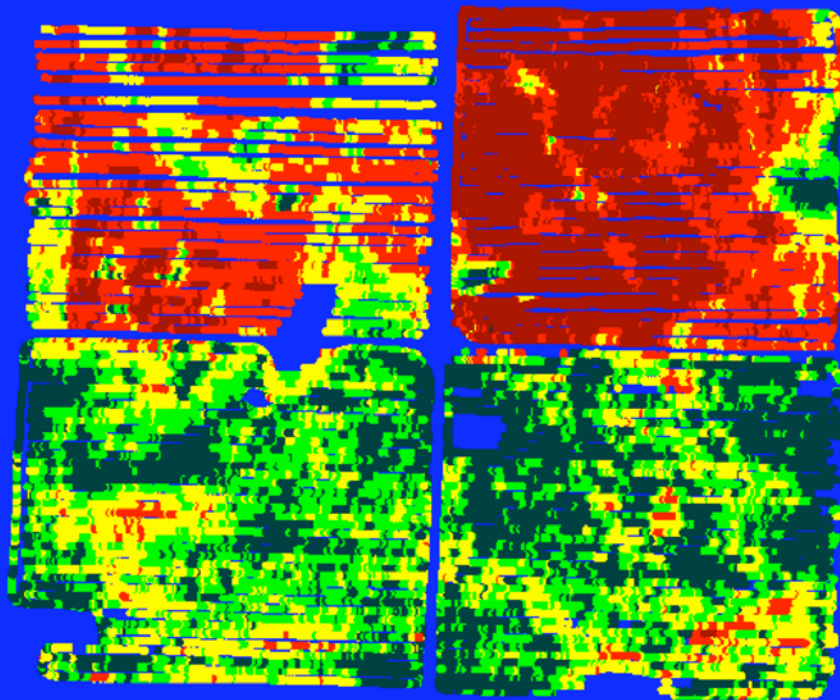
Areas grazed by cattle
and ungrazed areas
with impacts on following
crops



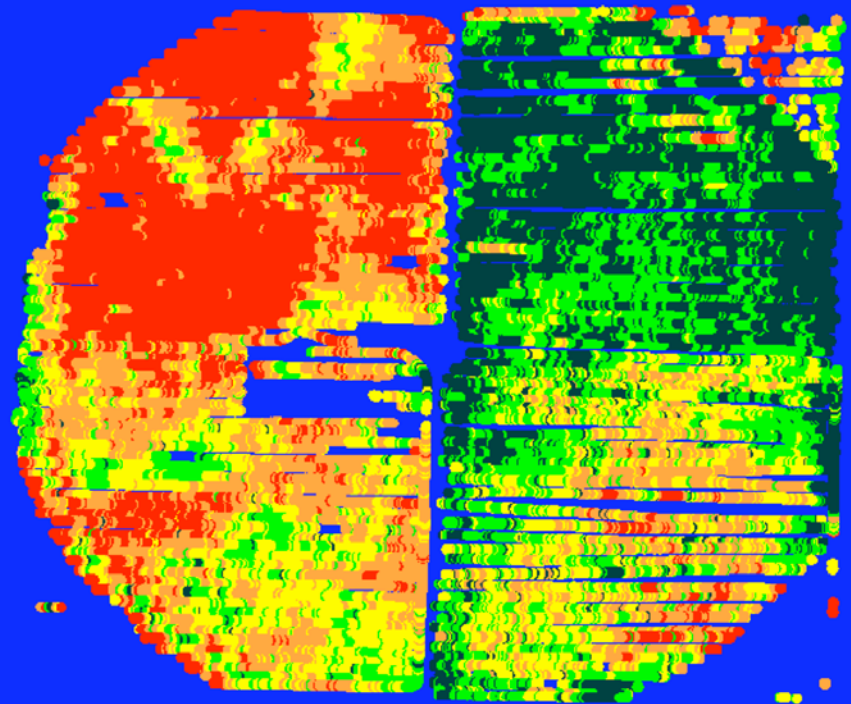




Electrical Conductivity (dS/m)



Spring 2006



Spring 2007

Variable-Rate Irrigation: Concept to Commercialization

Sprinklers Off





2 year old bahia

Peanut

1st year bahia

Cotton

**Overview of the Sodbased
Rotation
and Bahiagrass Breeding**

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Thank You!