Small Pasture-based Assessment of the Mississippi Phosphorus Index

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USDA ARS United States Department Of Agriculture Agricultural Research Service

Department of Plant & Soil Sciences, Mississippi State University

NRCS Natural Resources Conservation Service

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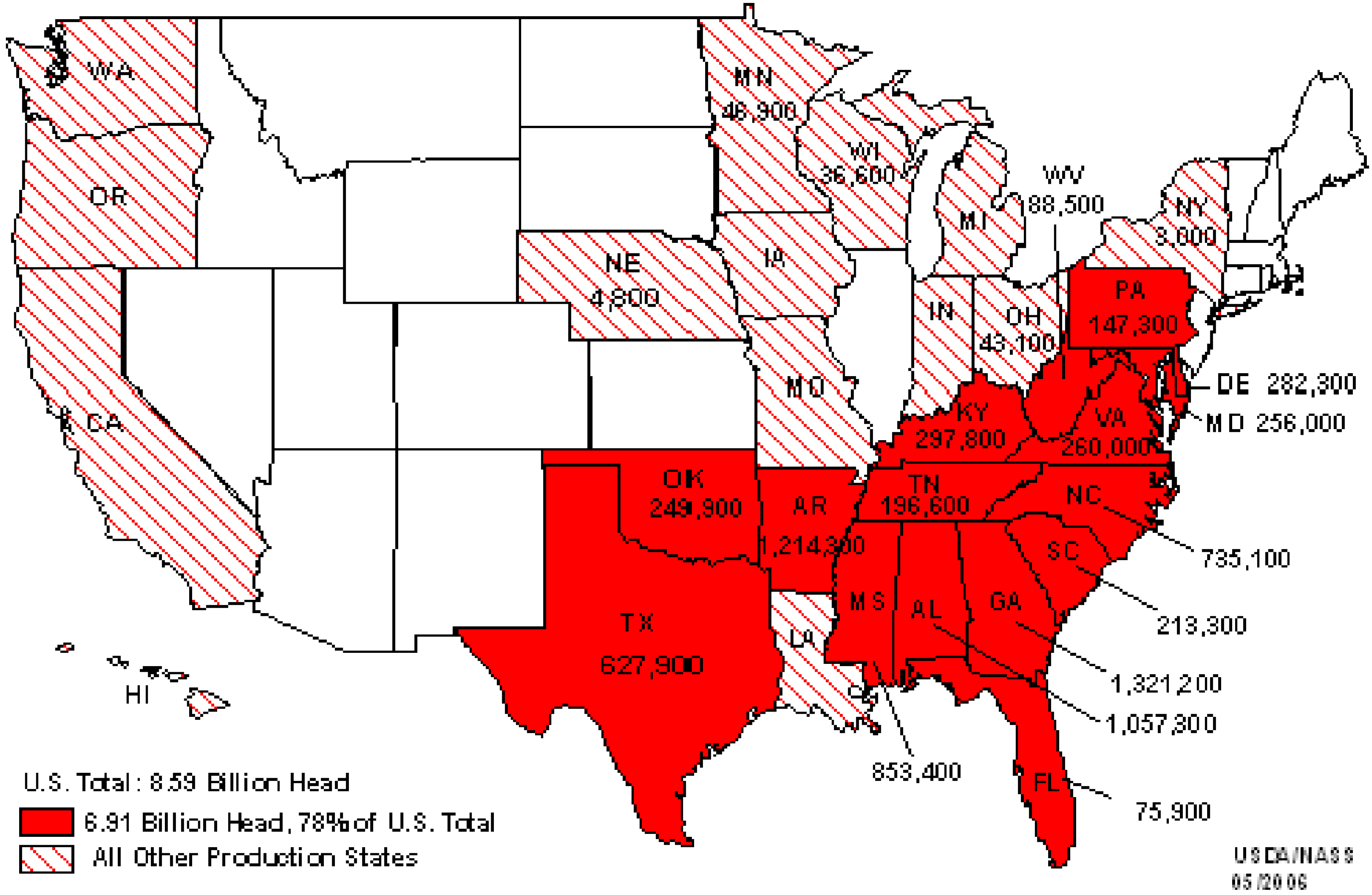
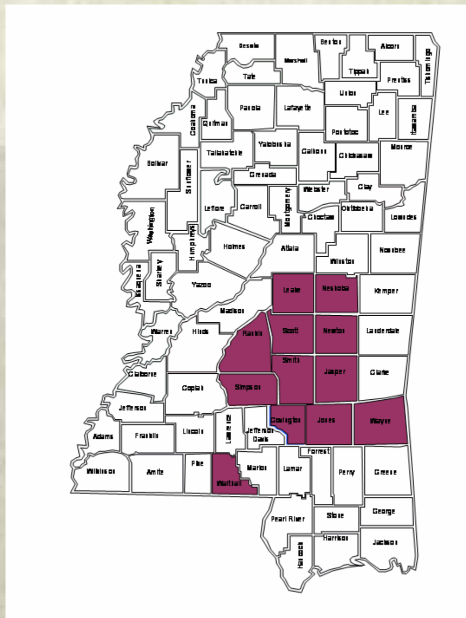
BROILER PRODUCTION BY STATES
NUMBER RAISED (000), 2005

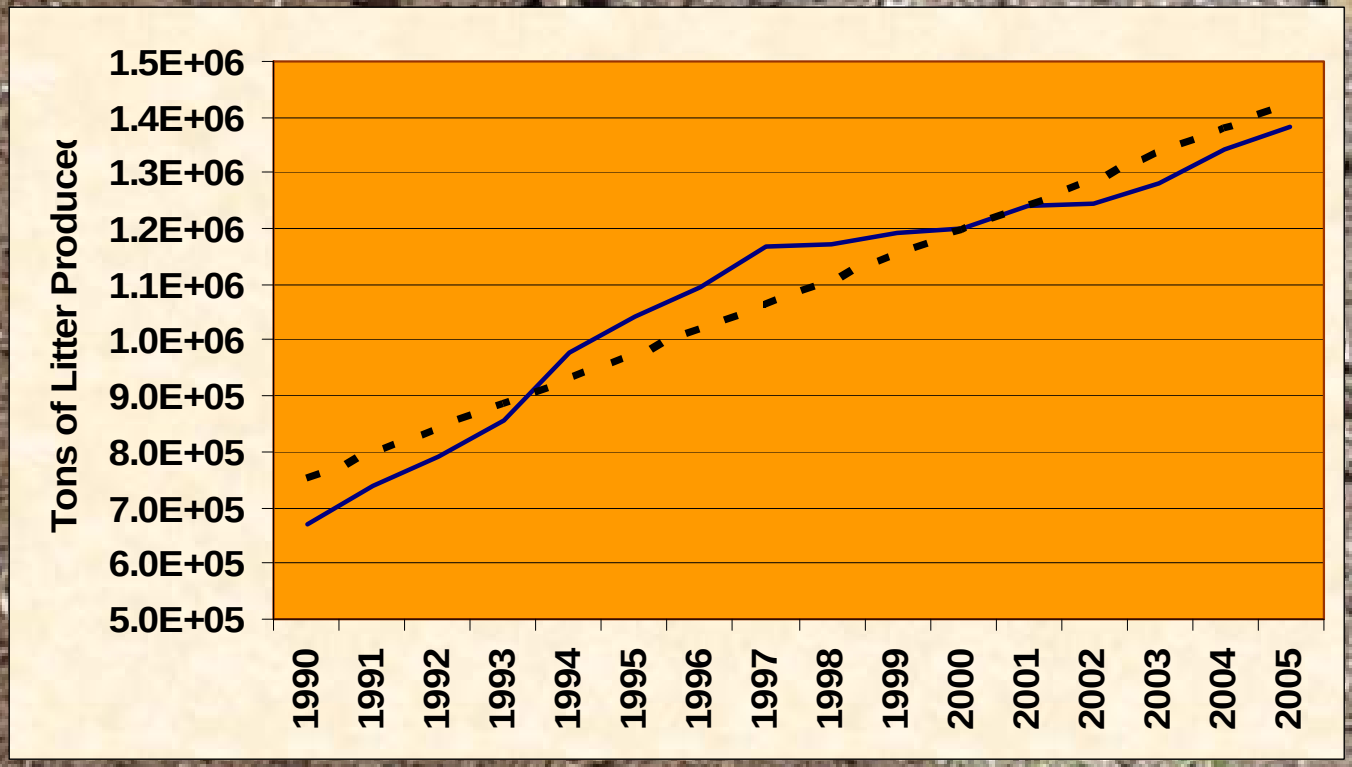



Benton
Alcorn
Tunica
Tate
Tippah
Prentiss
Union
Panola
Lafayette
Quitman
Lee
Pontotoc
Tallahatchie
Yalobusha
Calhoun
Chickasaw
Monroe
Bolivar
Grenada
Webster
Clay
Leflore
Carroll
Oktibbeha
Choctaw
Lowndes
Washington
Holmes
Attala
Noxubee
Winston
Sharkey
Yazoo
Leake
Neshoba
Kemper
Madison
Warren
Hinds
Rankin
Scott
Newton
Lauderdale
Smith
Jasper
Clarke
Claiborne
Copiah
Simpson
Jefferson
Covington
Jones
Wayne
Adams
Franklin
Lincoln
Jefferson Davis
Forrest
Wilkinson
Amite
Pike
Walthall
Marion
Lamar
Perry
Greene
Pearl River
Stone
George
Harrison
Jackson


Broiler litter is an excellent source of nutrients and is highly-valued by farmers.

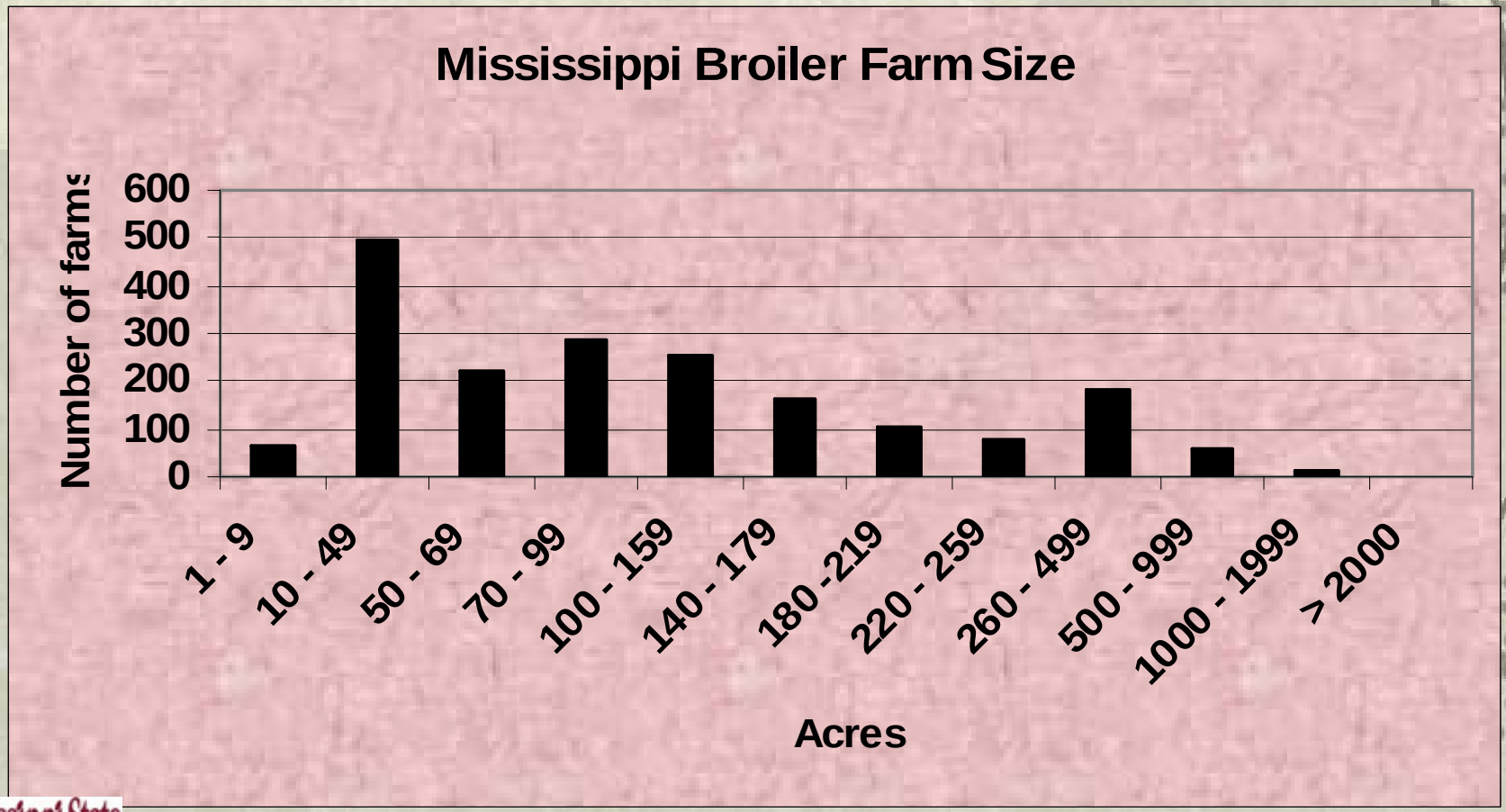
Most litter is spread on pastures and hay fields in the vicinity of the houses.

How big is the pile?



Litter Production, Top 12 MS Broiler Production Counties

Typical Mississippi Broiler Production Operation Acreage, 2002 Ag Census



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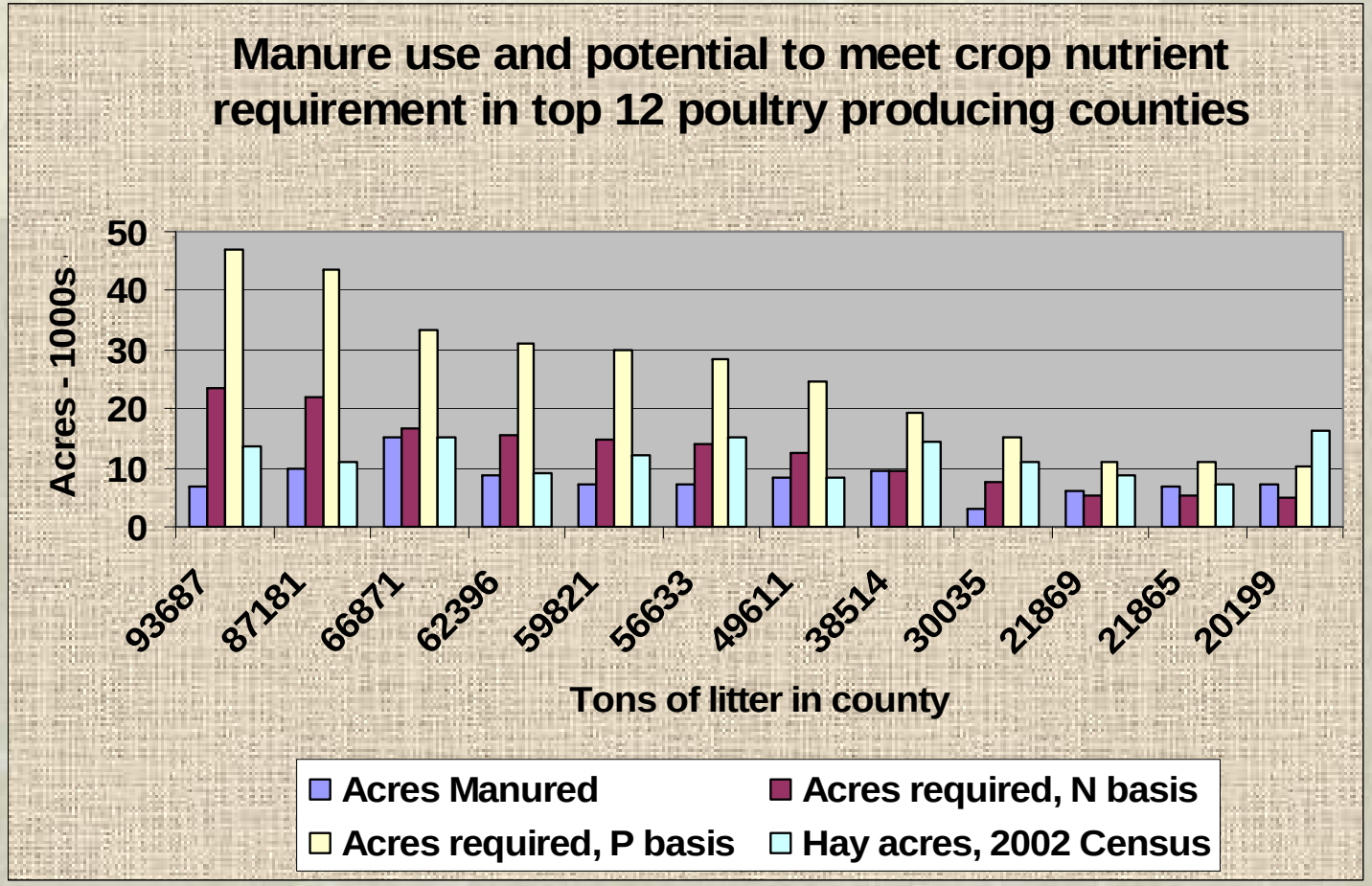
Available Acreages for Litter Using Current Practices, Top 12 MS Broiler Production Counties



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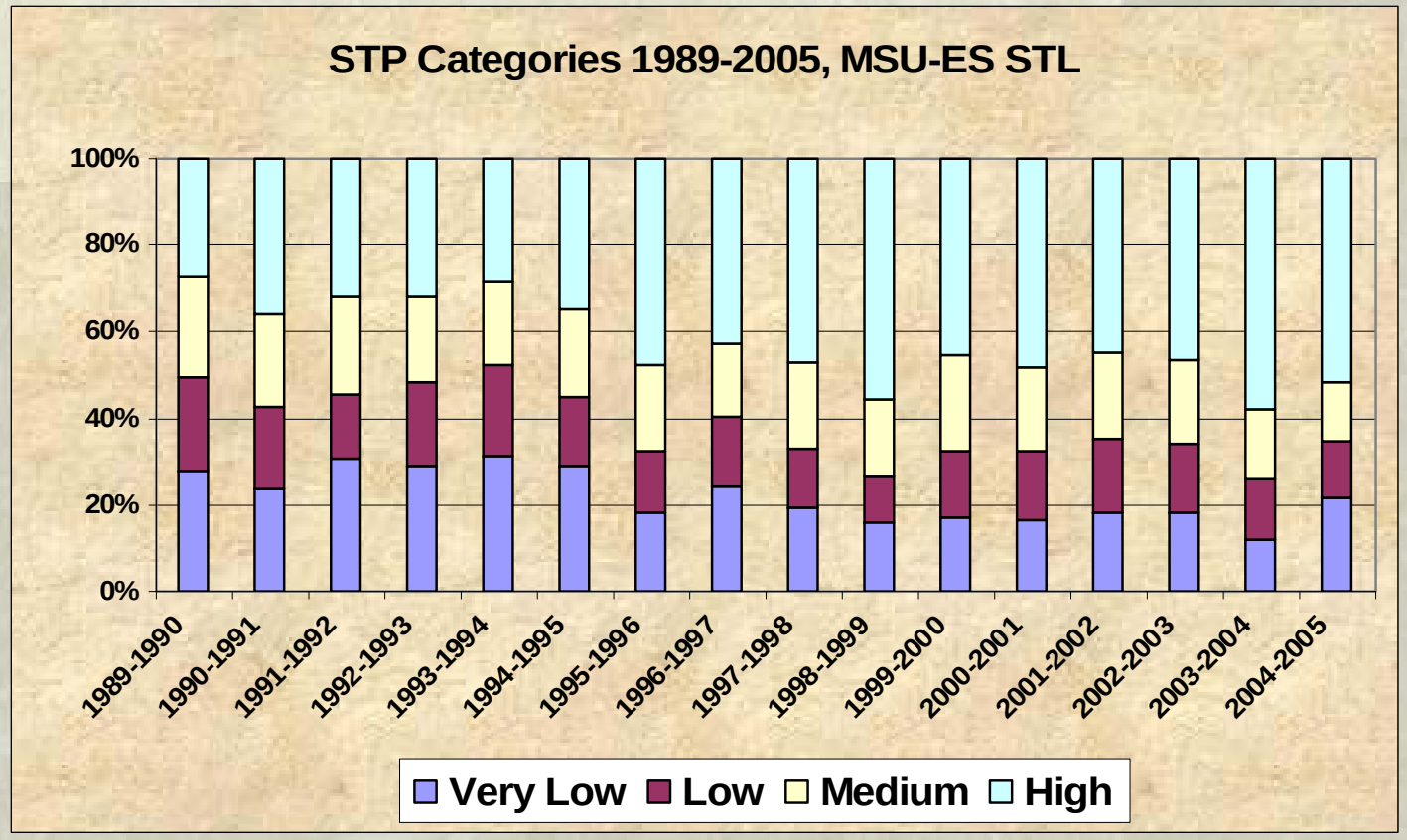
Soil Test Indices, Top 12 MS Broiler Counties



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Each state has a unique P Index

– Some quantitative (AR, GA, NC)

– Some qualitative (AL, FL, KY, LA, MS, SC, TN, TX)

– Varied time frame of development

Due to state-based uniqueness, each P Index has different "drivers"

– AL – Impaired waters

– GA – Buffers

– TN – Animal waste rate

– FL – Drainage depth

– NC – STP and soil type

– MS – STP

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Osmond et al., 2006

Factors in MS P Index

Transport

- Rainfall intensity & duration
- Surface runoff class
- Erosion potential
- Proximity to stream channel
- Soil texture & permeability

Source

- Soil P
- Fertilizer P
  - Rate, method, timing
- Manure P
  - Rate, method, timing

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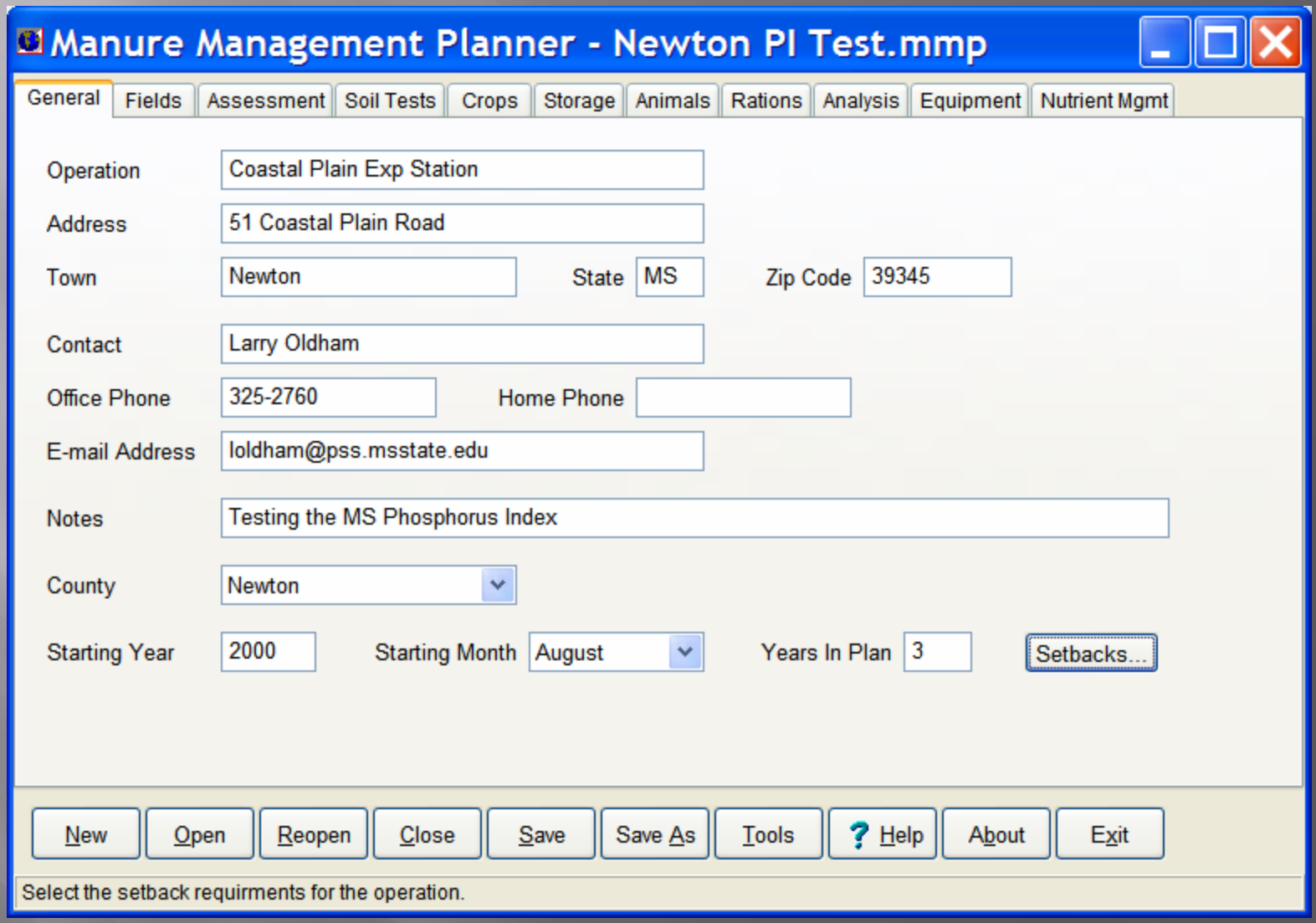
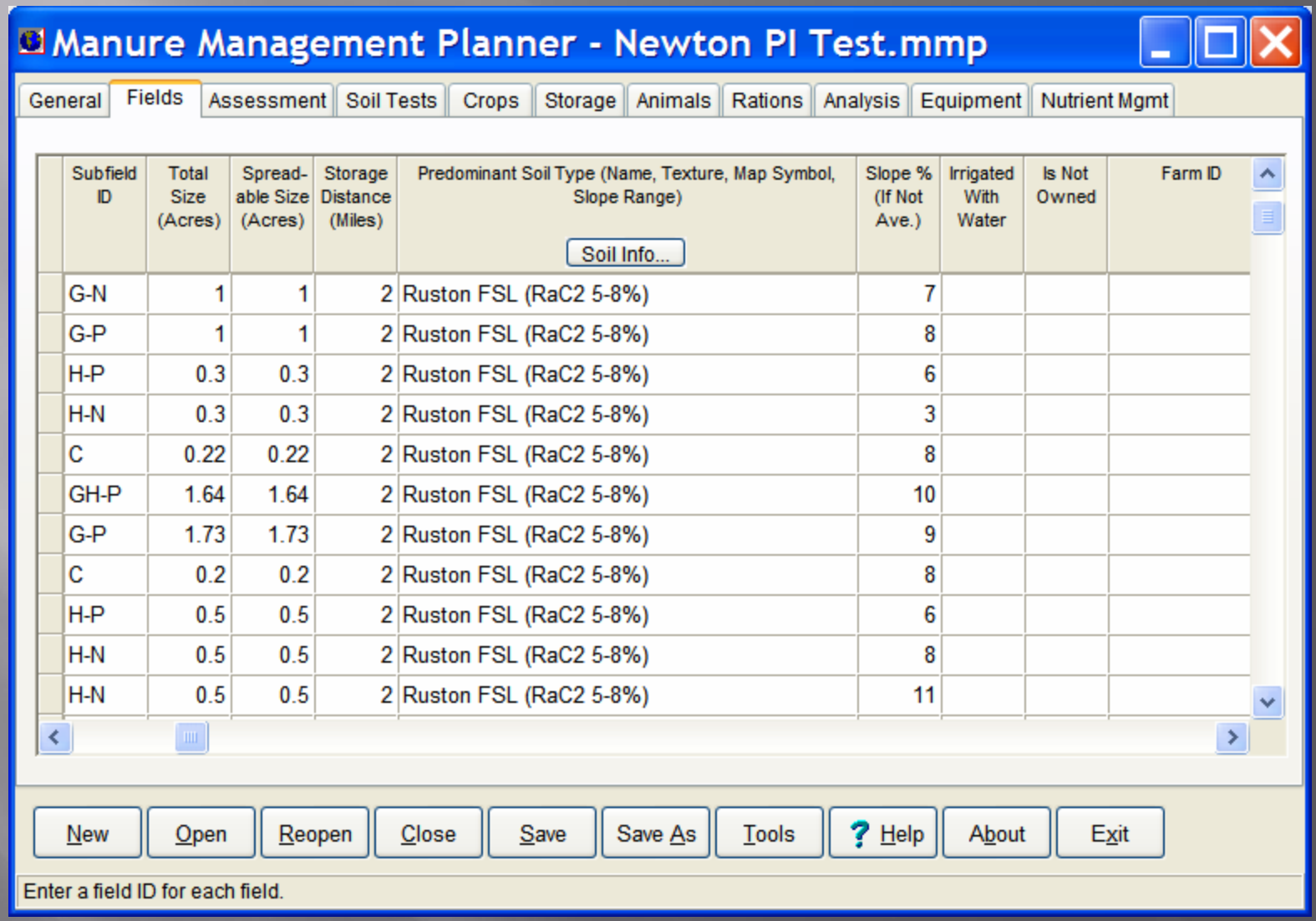

Manure Management Planner - Newton PI Test.mmp
General
Fields
Assessment
Soil Tests
Crops
Storage
Animals
Rations
Analysis
Equipment
Nutrient Mgmt
Operation
Coastal Plain Exp Station
Address
51 Coastal Plain Road
Town
Newton
State
MS
Zip Code
39345
Contact
Larry Oldham
Office Phone
325-2760
Home Phone
E-mail Address
loldham@pss.msstate.edu
Notes
Testing the MS Phosphorus Index
County
Newton
Starting Year
2000
Starting Month
August
Years In Plan
3
Setbacks...
New
Open
Reopen
Close
Save
Save As
Tools
Help
About
Exit
Select the setback requirments for the operation.


Manure Management Planner - Newton PI Test.mmp
General
Fields
Assessment
Soil Tests
Crops
Storage
Animals
Rations
Analysis
Equipment
Nutrient Mgmt
Subfield ID
Total Size (Acres)
Spread-able Size (Acres)
Storage Distance (Miles)
Predominant Soil Type (Name, Texture, Map Symbol, Slope Range)
Soil Info...
Slope % (If Not Ave.)
Irrigated With Water
Is Not Owned
Farm ID
G-N 1 1 2 Ruston FSL (RaC2 5-8%) 7
G-P 1 1 2 Ruston FSL (RaC2 5-8%) 8
H-P 0.3 0.3 2 Ruston FSL (RaC2 5-8%) 6
H-N 0.3 0.3 2 Ruston FSL (RaC2 5-8%) 3
C 0.22 0.22 2 Ruston FSL (RaC2 5-8%) 8
GH-P 1.64 1.64 2 Ruston FSL (RaC2 5-8%) 10
G-P 1.73 1.73 2 Ruston FSL (RaC2 5-8%) 9
C 0.2 0.2 2 Ruston FSL (RaC2 5-8%) 8
H-P 0.5 0.5 2 Ruston FSL (RaC2 5-8%) 6
H-N 0.5 0.5 2 Ruston FSL (RaC2 5-8%) 8
H-N 0.5 0.5 2 Ruston FSL (RaC2 5-8%) 11
New
Open
Reopen
Close
Save
Save As
Tools
Help
About
Exit
Enter a field ID for each field.

Pasture: bermudagrass overseeded with ryegrass

Litter management

4 T/acre to BG; 2 T/acre to RG

1 T/acre to BG; 1/2 T/acre to RG

Pasture management

graze continuously

hay only

hay bermudagrass, graze ryegrass

native (no animals or litter)

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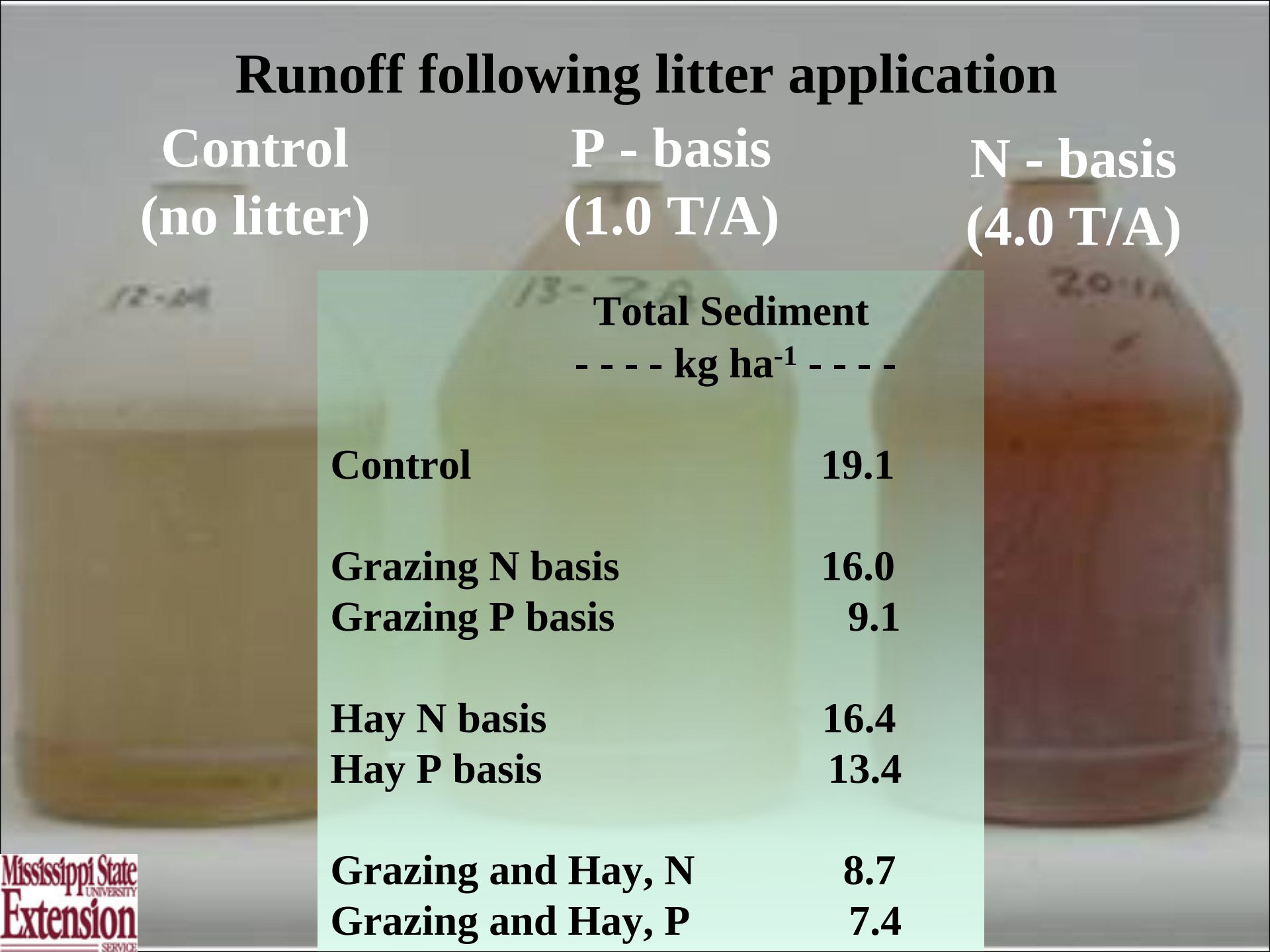
Runoff following litter application

Control (no litter) | **P - basis (1.0 T/A)** | **N - basis (4.0 T/A)**



	Total Sediment - - - - kg ha^{-1} - - - -
Control	19.1
Grazing N basis	16.0
Grazing P basis	9.1
Hay N basis	16.4
Hay P basis	13.4
Grazing and Hay, N	8.7
Grazing and Hay, P	7.4

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Sediment statistics

	Total Sediment - - - - kg ha^{-1} - - - -	
Control	19.1	
Grazing N basis	16.0	GN did not = GP
Grazing P basis	9.1	
Hay N basis	16.4	HN did not = HP
Hay P basis	13.4	
Grazing and Hay, N	8.7	GH-N = GH-P
Grazing and Hay, P	7.4	

GP = GH-N = GH-P

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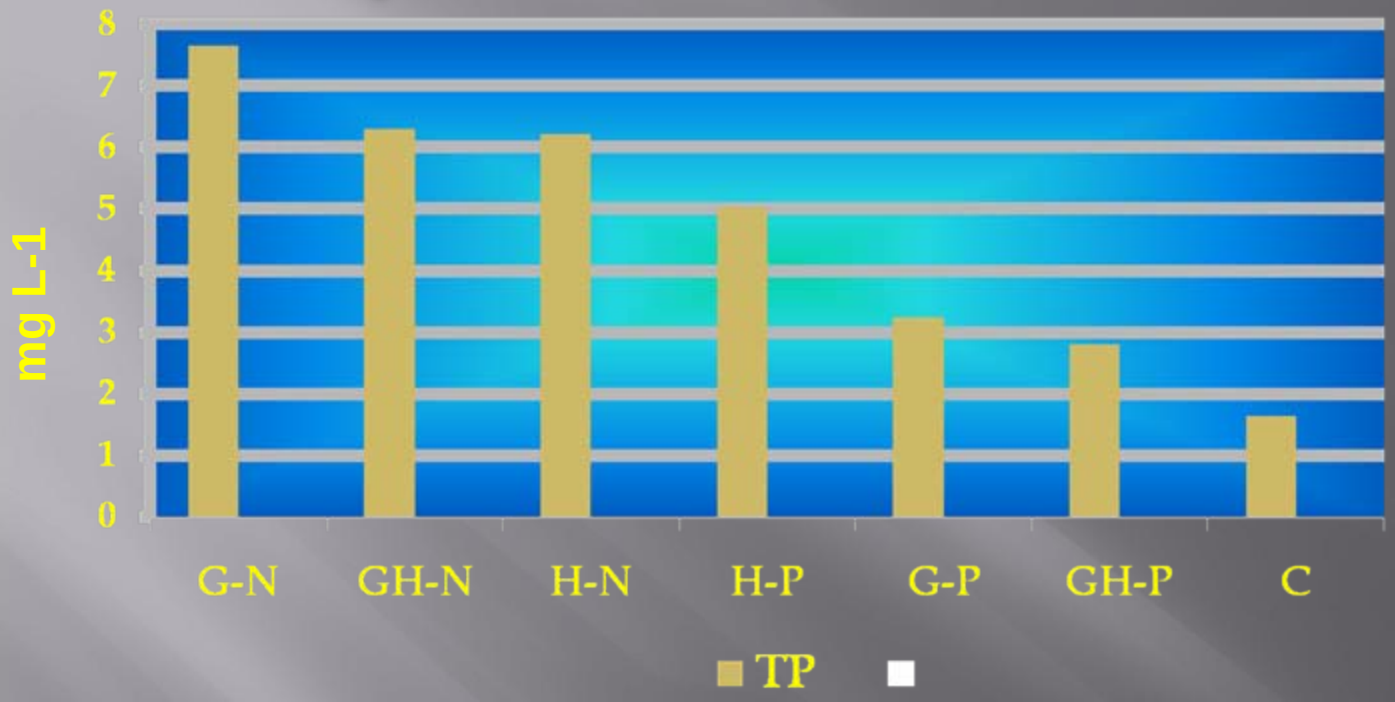
Phosphorus



TP

C = GH-P
GN
HN = HP = GH-N
GP = GH-P

SRP

Control
GN = HN = GH-N
GP = HP
GH-P

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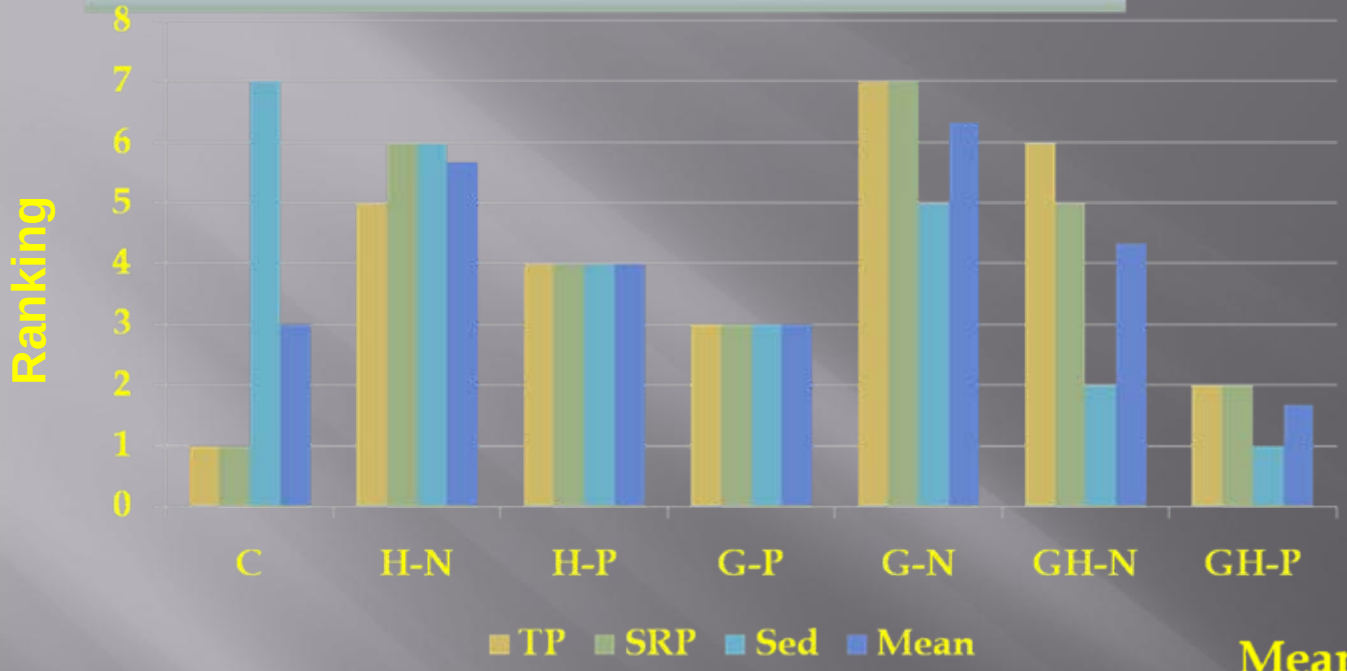
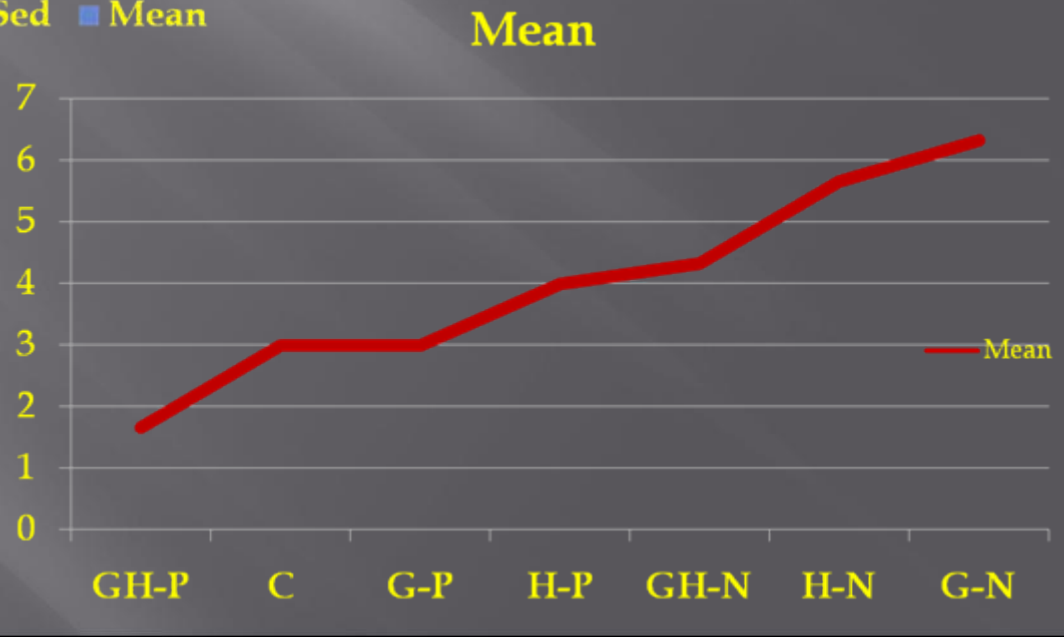
What really happened?





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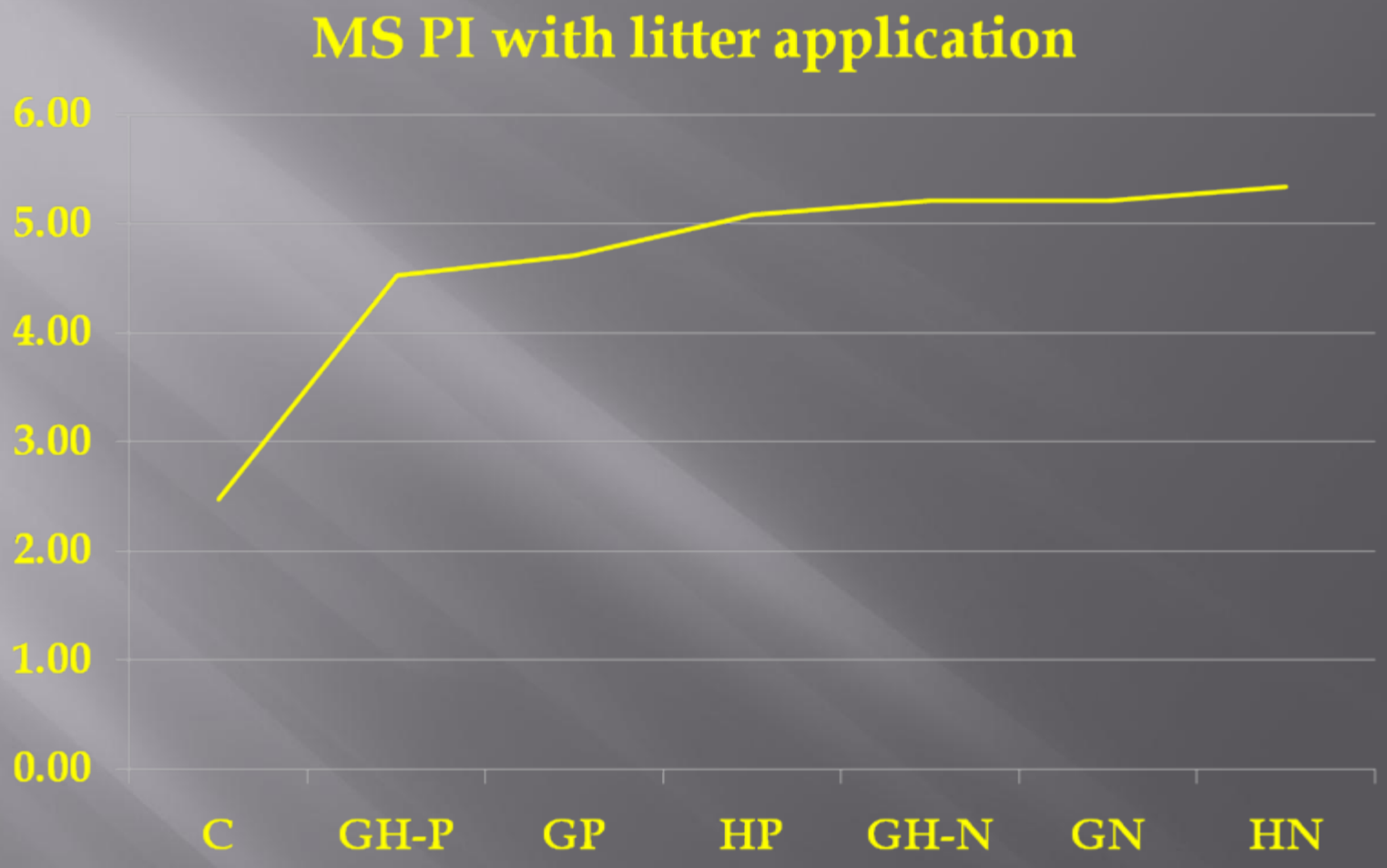

Data is from MMP PI runs at 50, 100, and 250 lbs/acre STP, on a per plot basis, across the three years of the experiment.

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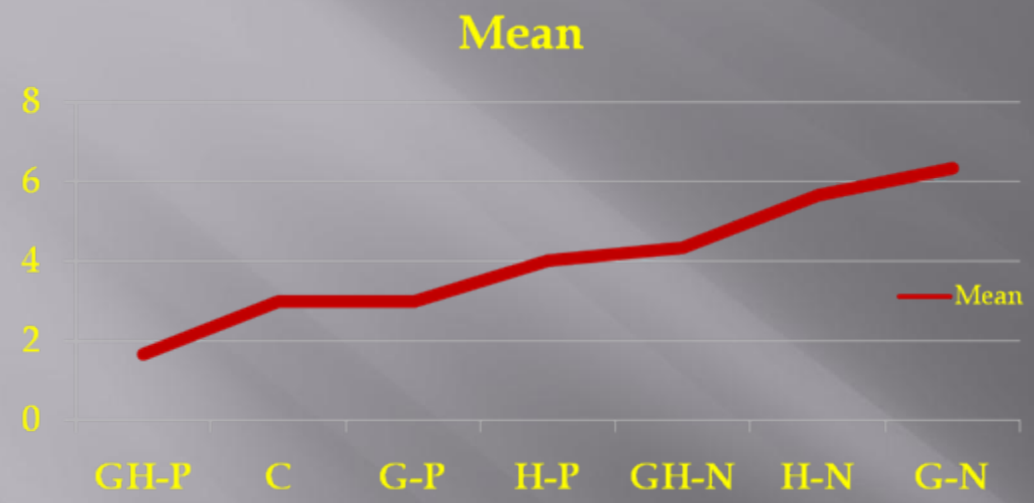
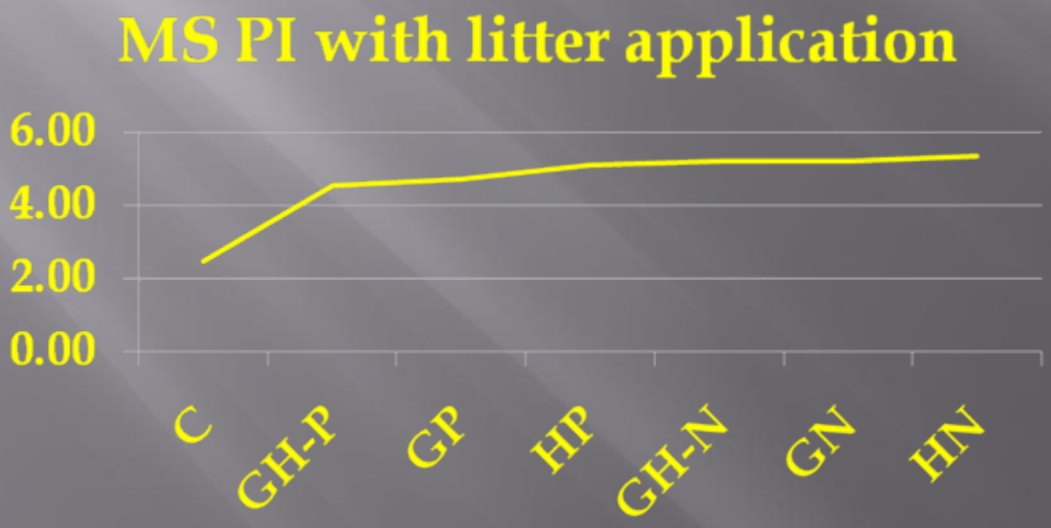
Let's look at that again:



$r^2 = 0.56$



Considerations

All systems had no soil mixing other than cattle

- **measured sediment actually less than 1 t/acre**

PI calc's were worst case scenarios:

- **0 distance, 4 t/acre soil loss**

Results confirm utility of PI as a teachable moment

- **reaffirms Mississippi use as risk assessment**

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Considerations

Highest sediment not necessarily correlated with P loss variables

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