

Nutrient Response Functions for Rice



Tim Walker
Assistant Agronomist

Outline

- **Nitrogen**
 - **Nitrogen Costs: How high is too high?**
 - **Recommendations: Where do they come from?**
 - **Efficiency: How do I maximize the return on investment (ROI)?**
 - **Special Situations**

Outline

- **Phosphorus**
 - **Critical levels**
 - **Efficient P management**
- **Potassium/Zinc**
 - **Preliminary Results**

A background image of white rice grains, slightly faded, with a dark red oval in the center containing the word "Nitrogen".

Nitrogen

Nitrogen Costs: How high is too high?



Nitrogen Costs: How high is too high?



How High is Too High?

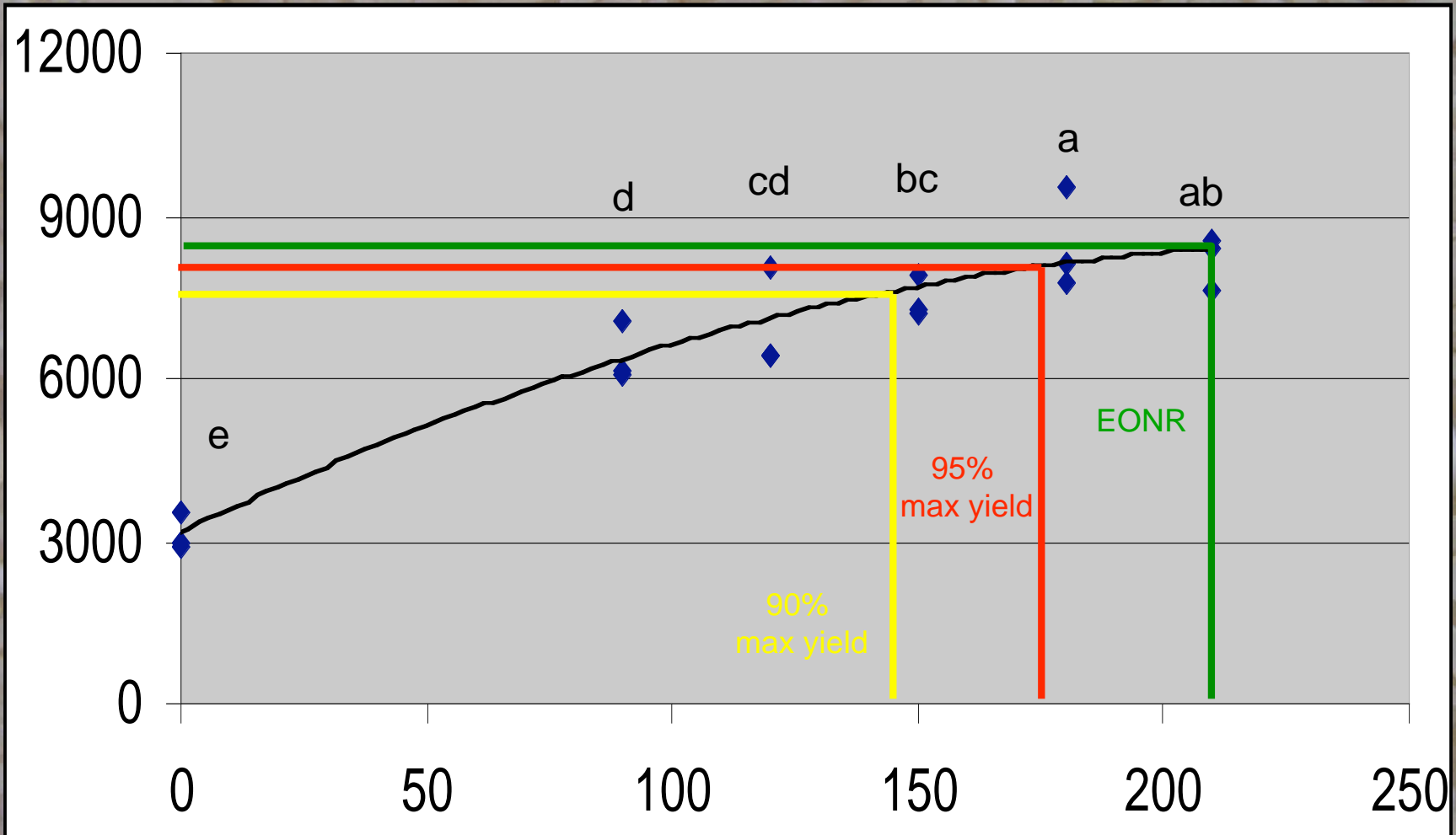
- Nitrogen costs for 2007 were \$70/acre compared to \$34/acre in 2000 (\$36▲)
- In 2007, growers averaged 32 bu/a greater at an average price of \$1.40/bu greater than in 2000
- Approx. \$10/acre greater ROI when fertilizer only is considered for 2007 compared to 2000

Recommendations: Where do they come from?

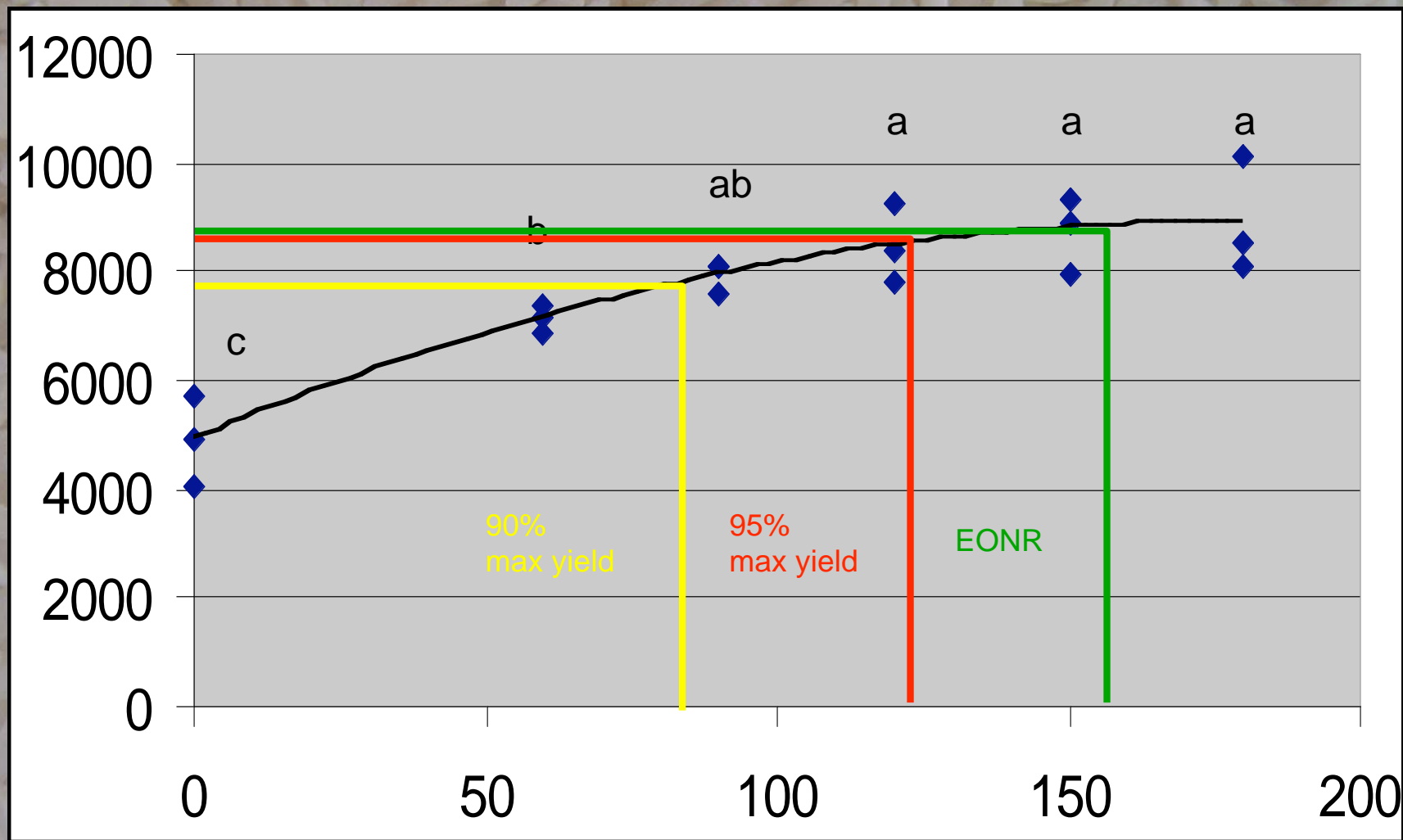
- **N rate response plots**
 - Soil type
 - Cultivars
 - Years
- **Standard Statistical Approach – LSD**
- **Rate Range**



N Response Curve – CL171AR Clay Soil



N Response Curve - CL171AR Silt loam soil



Economic Optimal N Rate (EONR)

Urea cost	Rice Price \$/bu							
	\$4.50	\$4.73	\$4.95	\$5.18	\$5.41	\$5.63	\$5.86	\$6.08
\$200	226	227	228	229	229	230	231	231
\$250	223	224	225	226	227	228	228	229
\$300	220	221	222	223	224	225	226	227
\$350	217	218	220	221	222	223	224	224
\$400	214	215	217	218	219	220	221	222
\$450	211	213	214	215	217	218	219	220
\$500	208	210	211	213	214	215	217	218
\$550	205	207	208	210	212	213	214	215
\$600	202	204	206	207	209	210	212	213
	24	23	22	22	20	20	19	18

N Management Tips for Maximum ROI

- **Soil Types can differ on the amount of N needed**
- **Early flood management**
 - **Timeliness**
 - **In 2006 and 2007 on clay soils, 0.7 bu/day loss when fields were flooded 10 DAA compared to 2 DAA**
 - **Agrotain has proven effective when volatilization is culprit of N loss**
 - **Multiple inlet irrigation**

N Management Tips for Special Needs

- Sheath blight susceptibility

CL171AR



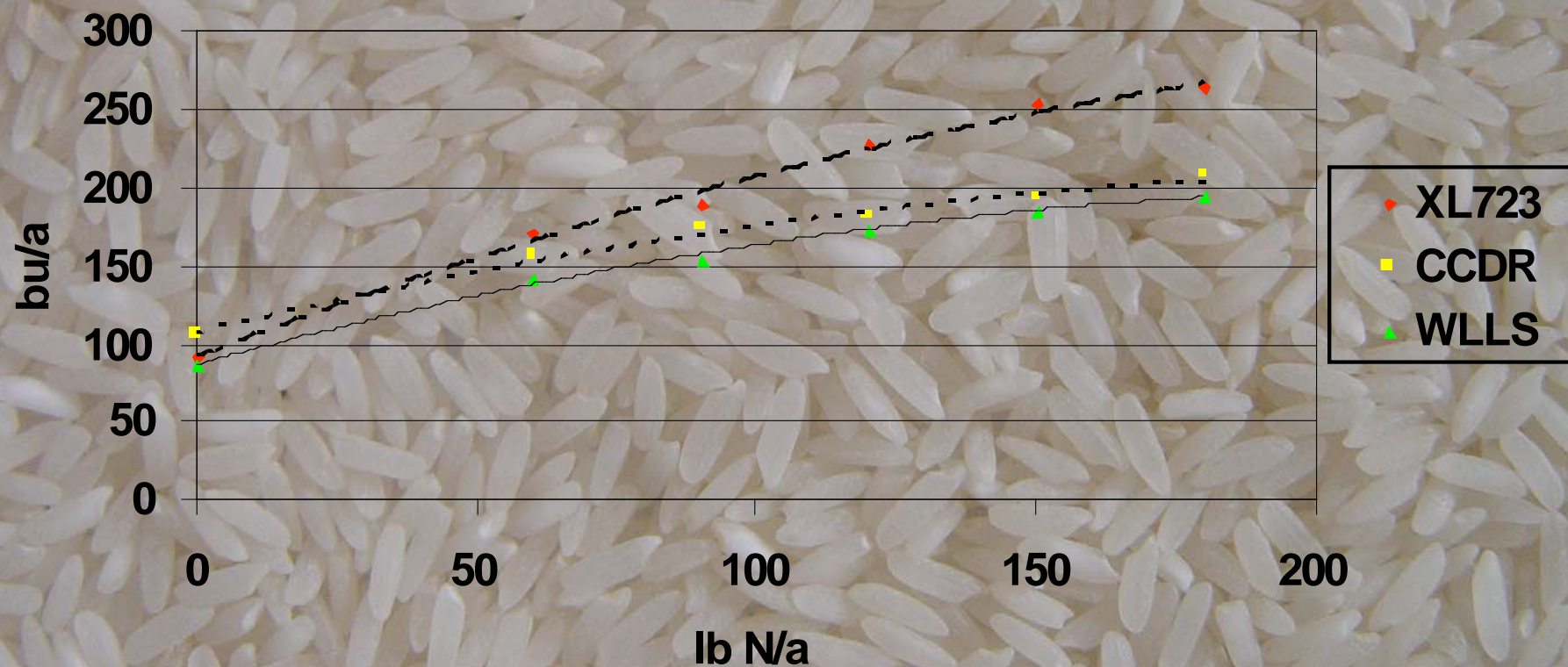
N Management Tips for Special Needs

- Lodging

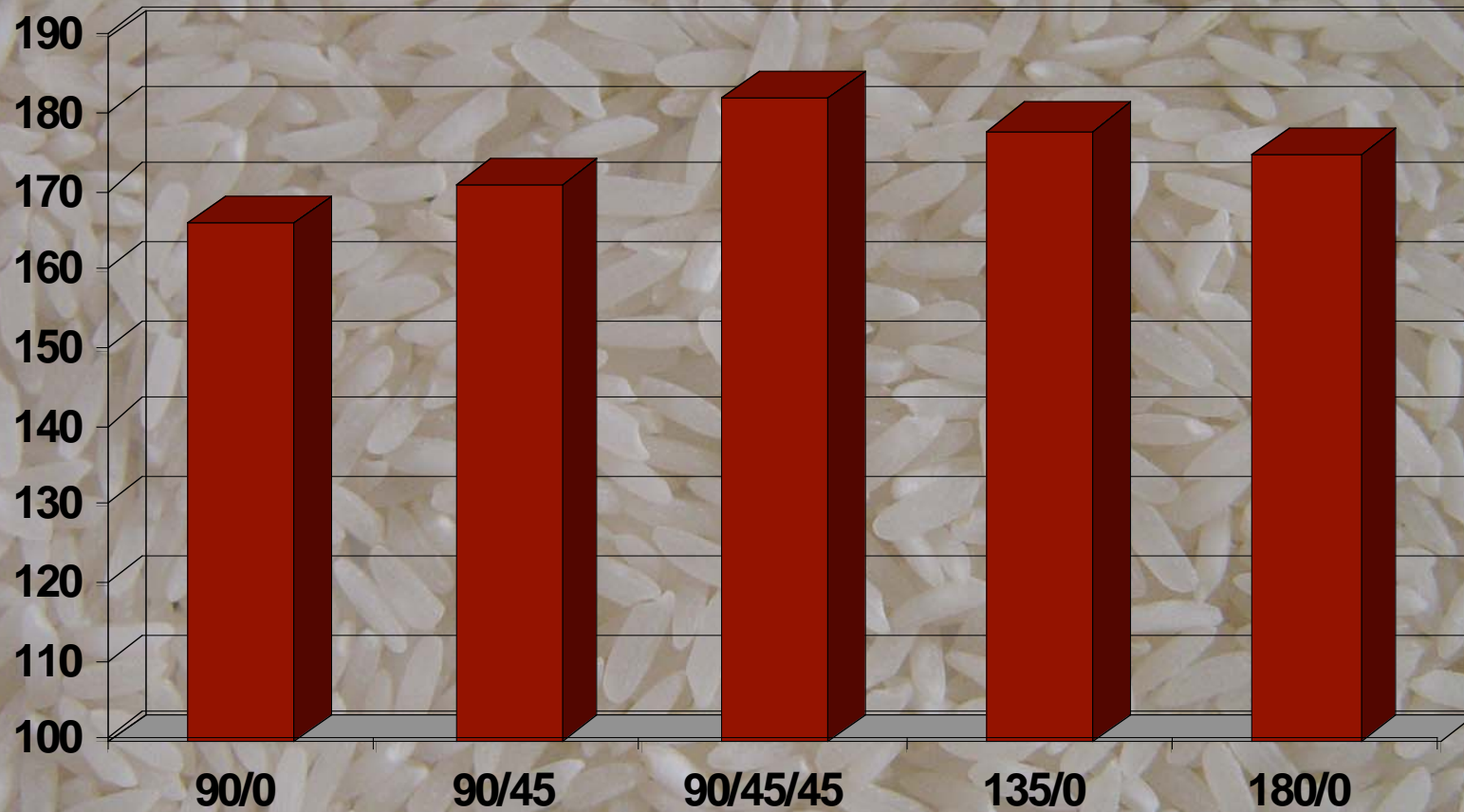
Hidalgo



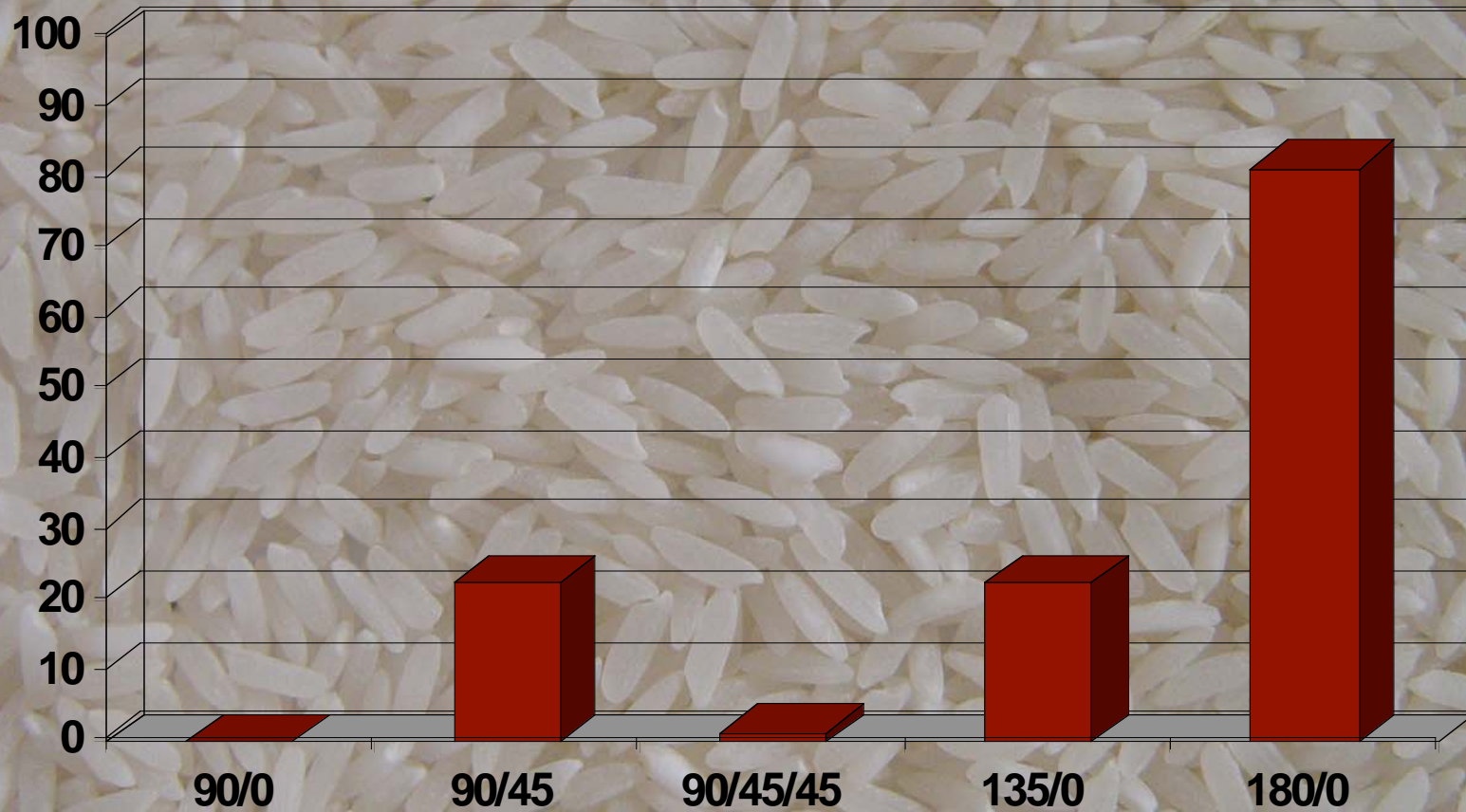
N Management Tips for Special Needs



Hidalgo - Yield



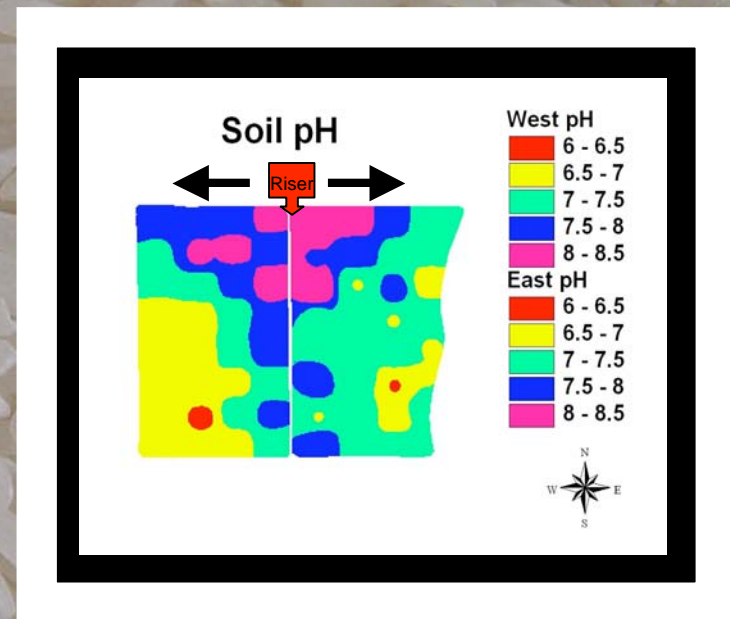
Hidalgo - Lodging



The image features a dense, uniform background of white, long-grained rice. In the center, there is a dark red, horizontally-oriented oval with a thin black border. Inside this oval, the word "Phosphorus" is written in a bold, white, sans-serif font.

Phosphorus

Why Phosphorus?



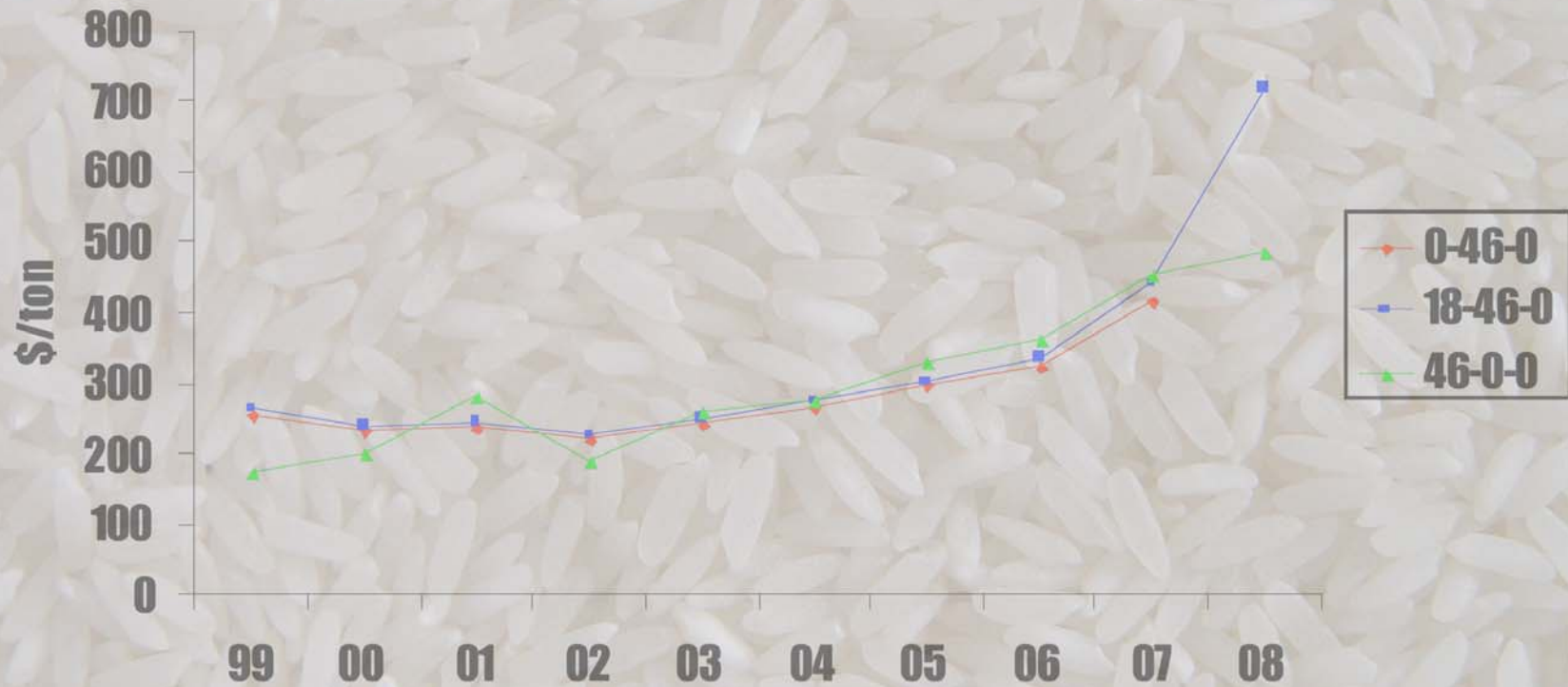
Addressing P Needs



17%
Yield
Response

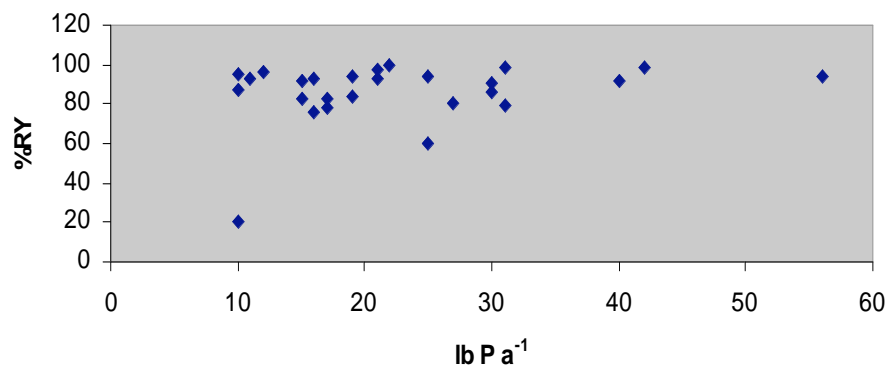
Introduction

Recent Fertilizer Price History

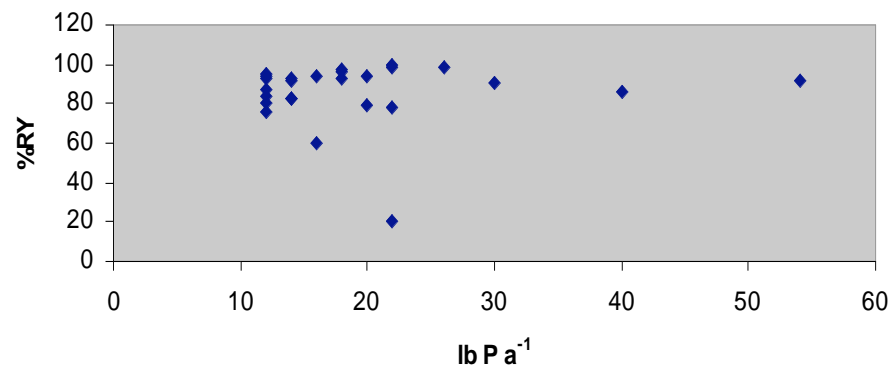


Results

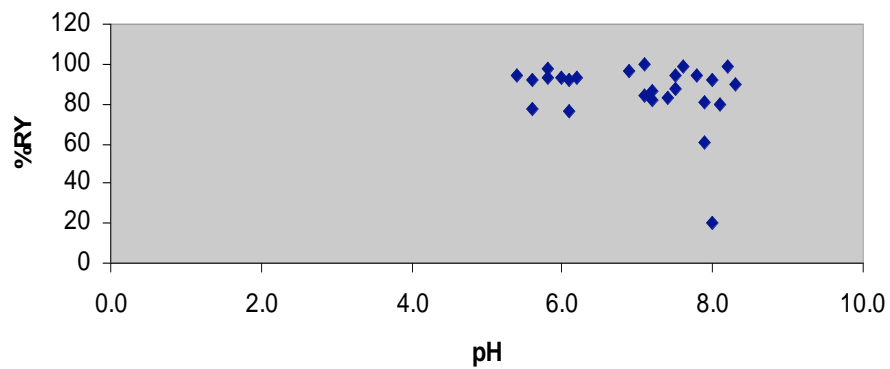
Lancaster-P



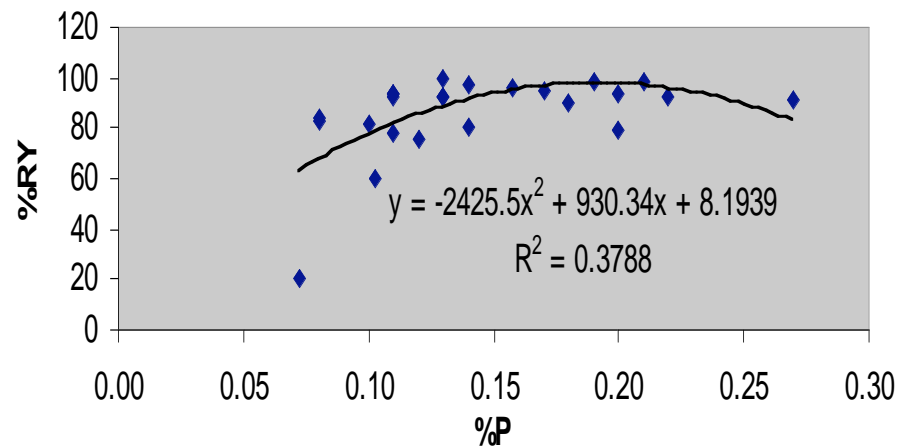
Mehlich 3-P



Soil pH

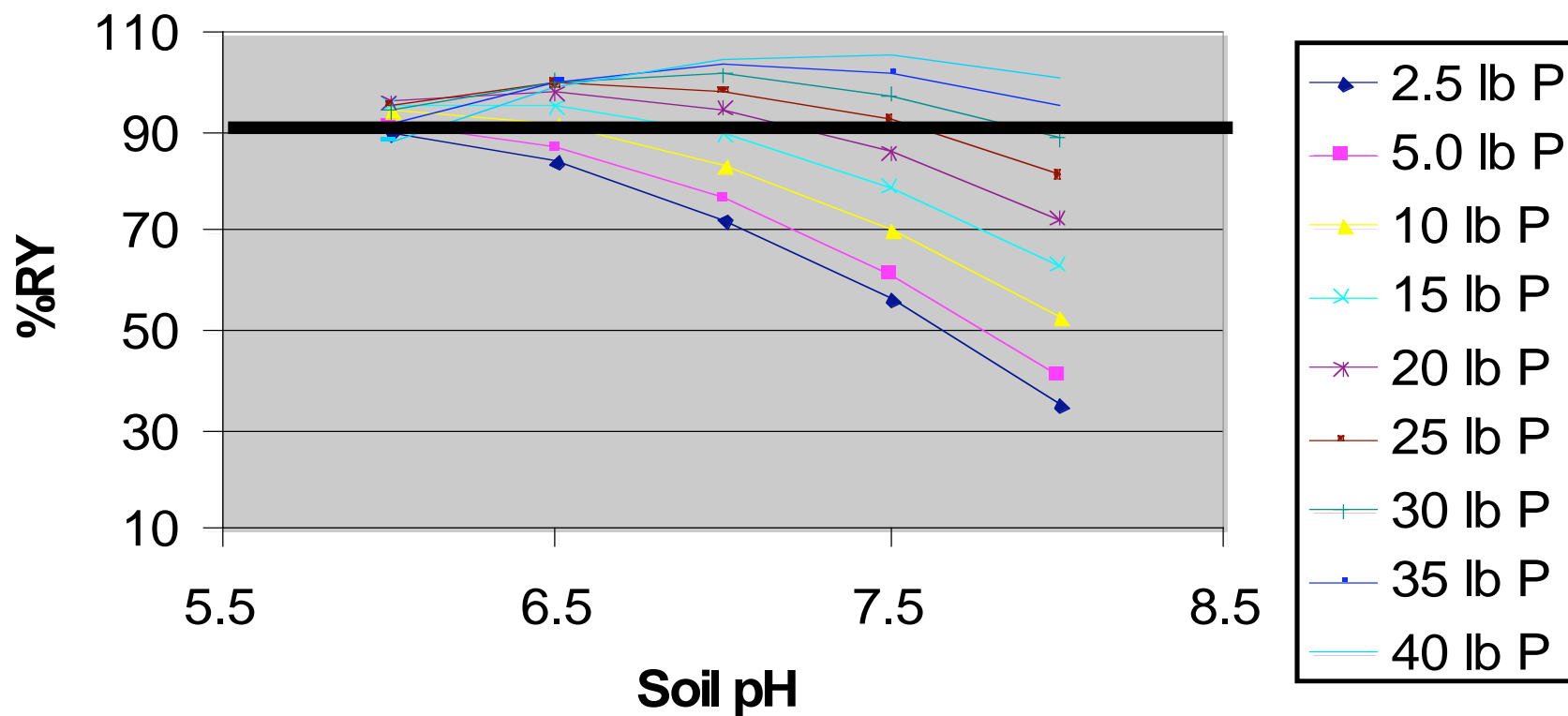


%Tissue P - PD



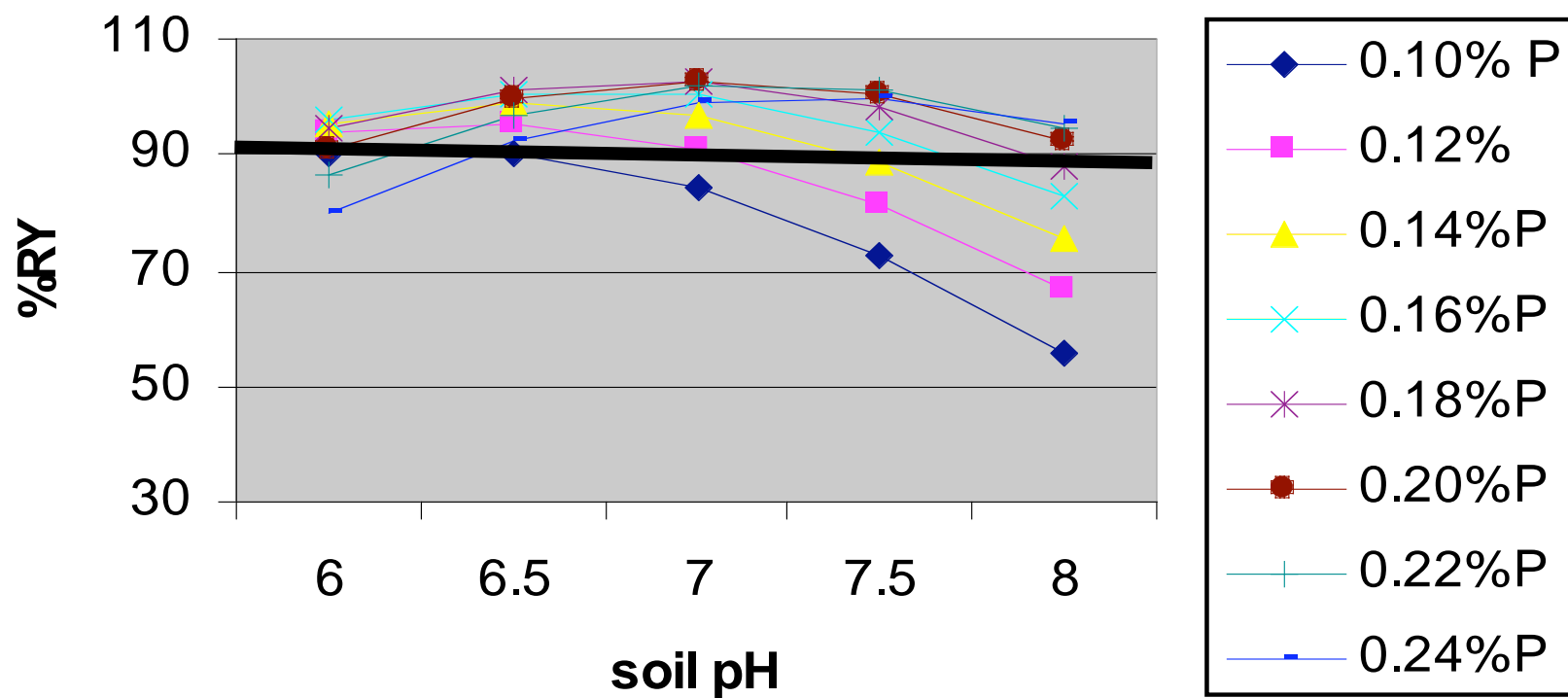
Results

%RY as a function of pH and Lan-P



Results

%RY as affected by %P and Soil pH



Summary

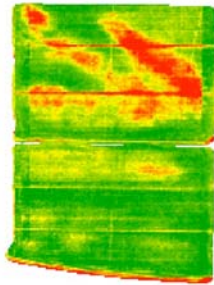
- **Lancaster-P and Mehlich 3-P are not correlated with relative rice grain yield in Mississippi.**
- **Multiple regression with Lancaster-P and soil pH resulted in a significant ($P = 0.05$; $R^2 = 0.43$) model**
 - **90% RY at pH 6.0 = 2.5 lb P a⁻¹**
 - **90% RY at pH 8.0 = 33 lb P a⁻¹**

Summary

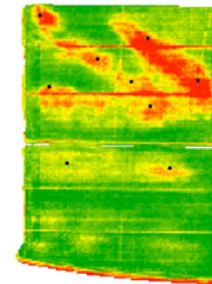
- **Multiple regression model using Mehlich 3-P and %P could be used as a diagnostic/zone development tool ($P = 0.002$; $R^2 = 0.62$)**
- **Multiple regression model using soil pH and %P could be used as a diagnostic/zone development tool ($P = 0.0001$; $R^2 = 0.74$)**
 - **90% RY at pH 6.0 = 0.1%P**
 - **90% RY at pH 8.0 = 0.2%P**

Precision P Application

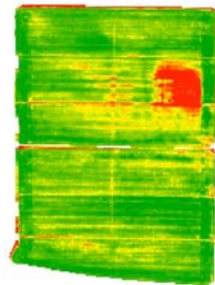
2005 NDVI



2005 NDVI
Directed Sampling



2007 NDVI
After P Fertilizer



- **Vegetative Index**
- **Soil/tissue sampling**
- **VRT – P application0**

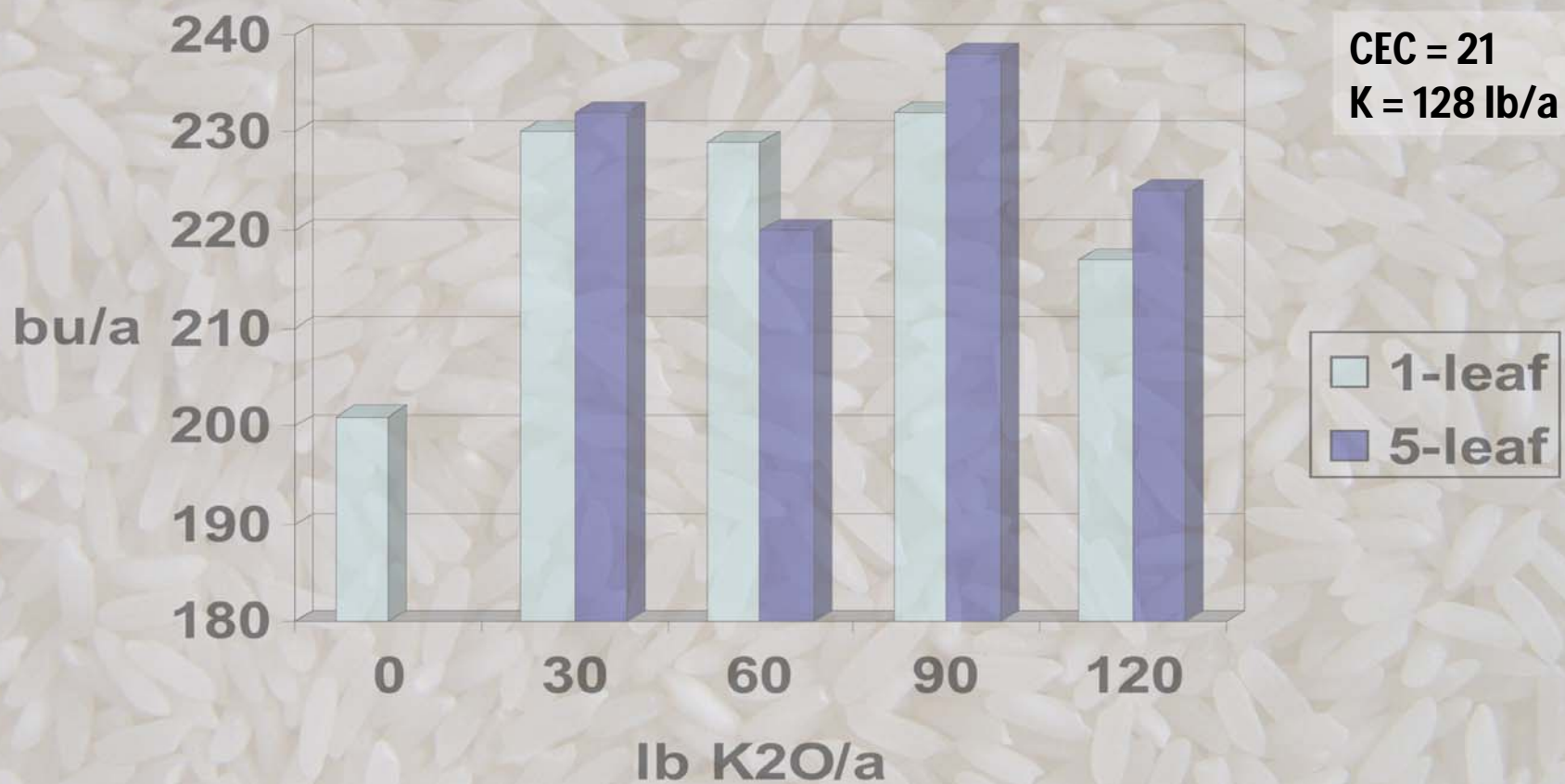
Addressing P Needs

- **Timing is critical in responsive locations**
 - 1-leaf and 5-leaf applications have produced 8 to 10% greater yields compared to fall
- **Rates**
 - Under severe P stress, 50 lb P_2O_5 /a will provide optimum yields
 - 75 to 100 lb P_2O_5 /a will provide build-up

The image features a dense, uniform background of white, long-grained rice. In the center, there is a dark red, horizontally-oriented oval with a thin black border. Inside this oval, the word "Potassium" is written in a bold, white, sans-serif font.

Potassium

Potassium





Zinc

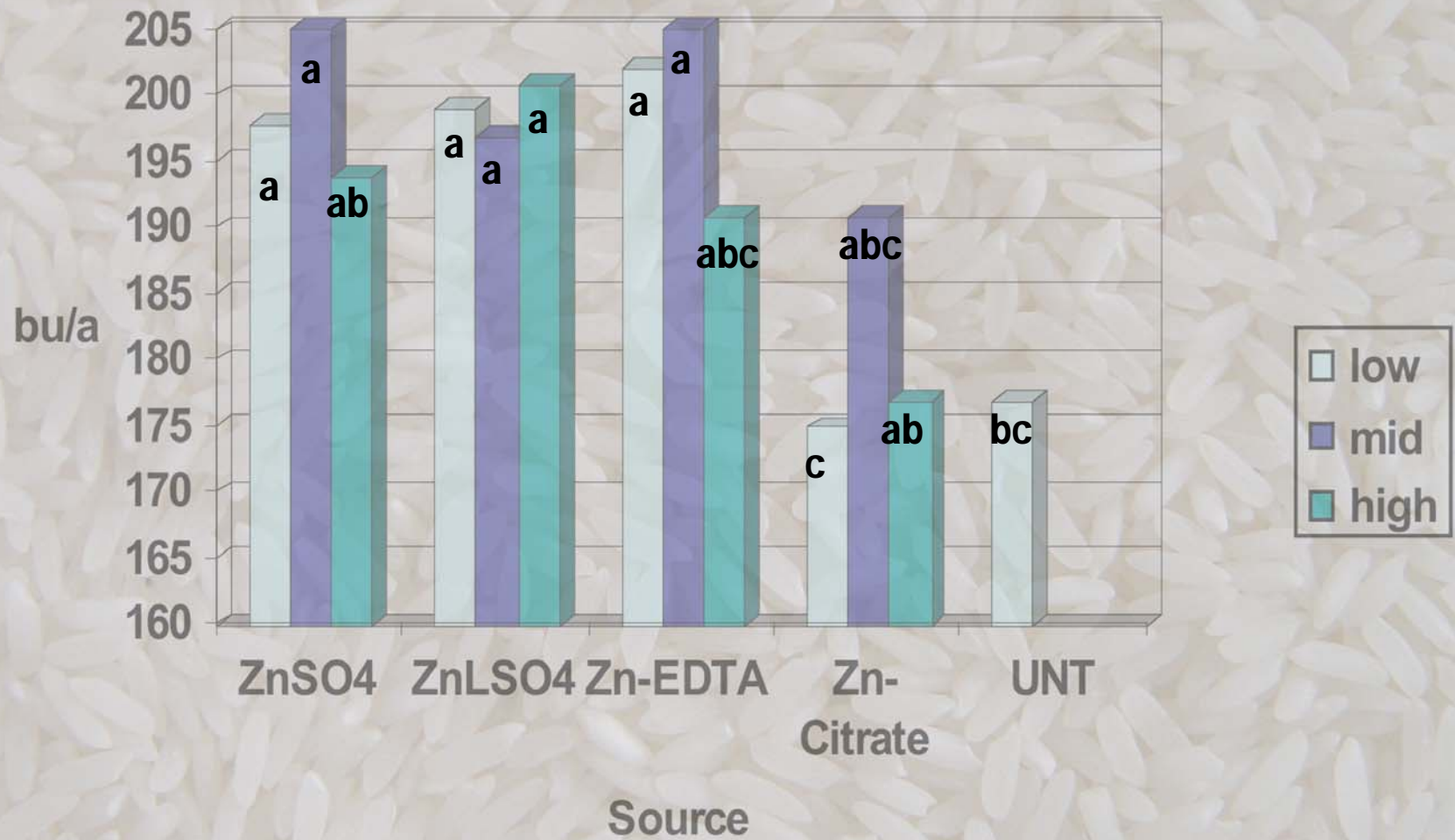
Addressing Zn Needs



35% yield reduction



Zinc Response



Zn Recommendations

- **Cut areas of coarse-textured soils**
- **High pH**
- **Zn-EDTA**
 - 1.0 lb/a tank mix w/preflood herb.
- **Granular at 5 lb/a**
 - Build soil Zn levels

Questions

