



# **Precision Farming Practices Impact on Sugarbeet Production in MN and ND**

**American Crystal Sugar Company**

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**Agronomy Manager**

**Moorhead and Hillsboro Districts**

**Other Contributors**

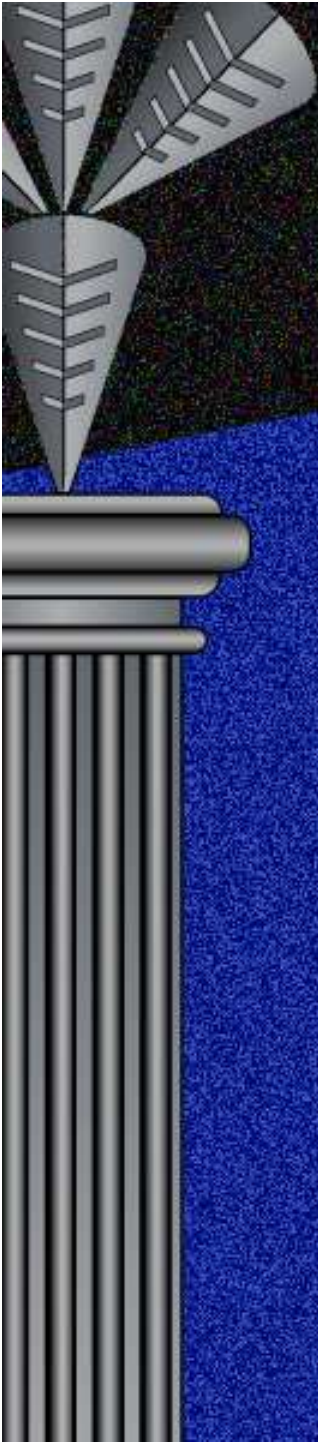
**Dan Bernhardson**

**Al Cattanach**

**Ron Ellingson**





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- As early as 1993, Moraghan and Smith began defining the significance of available nitrogen being returned to the soil by beet tops.
  - In 1997 Moraghan defined a plan for managing nitrogen credits found in beet tops.





# Available Nitrogen in Different Color Canopies

Canopy	Dry matter	Total N	Total N
	lb/acre	%	lb/acre
<u>Green</u>	7940	3.5	276
<u>Yellow-green</u>	6160	2	125
<u>Yellow</u>	4190	1.3	55



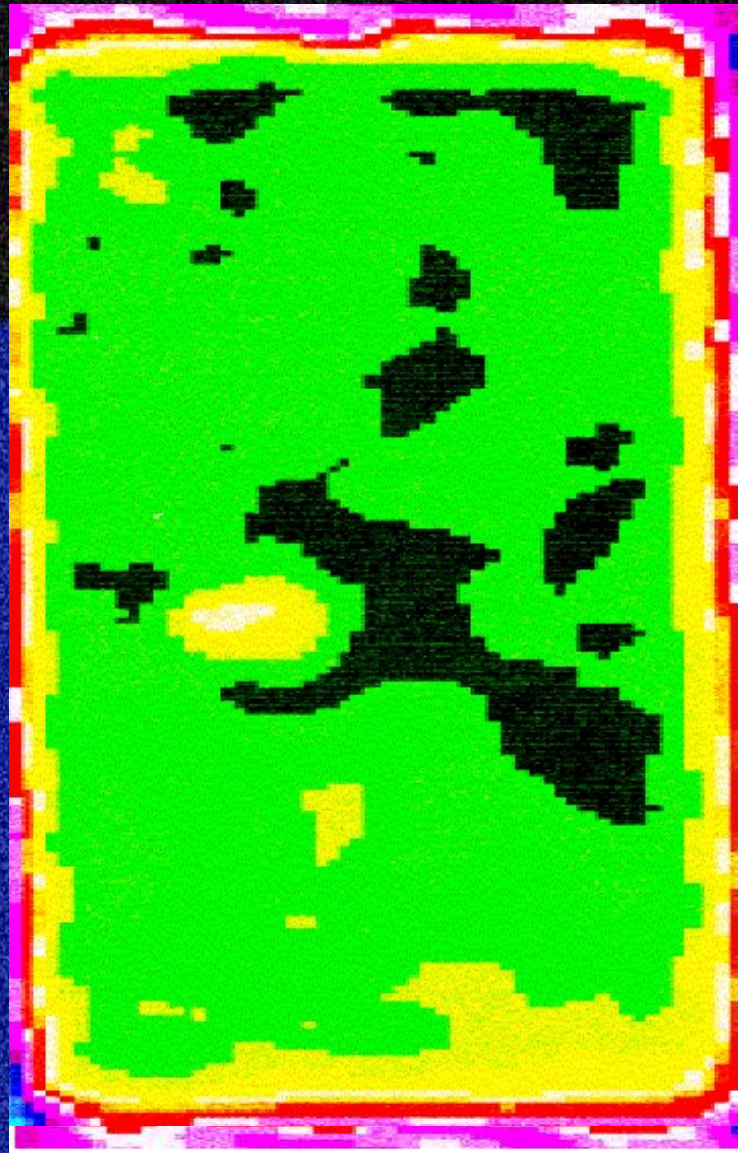


# Aerial photo of sugarbeet field





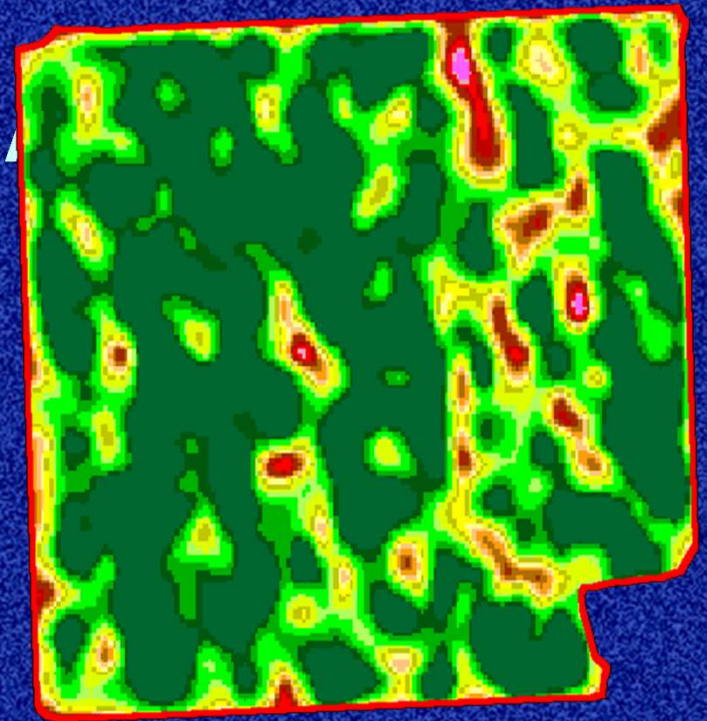
- Satellite Image taken August 25, 1997.





- It all starts with an image of the sugarbeet field.

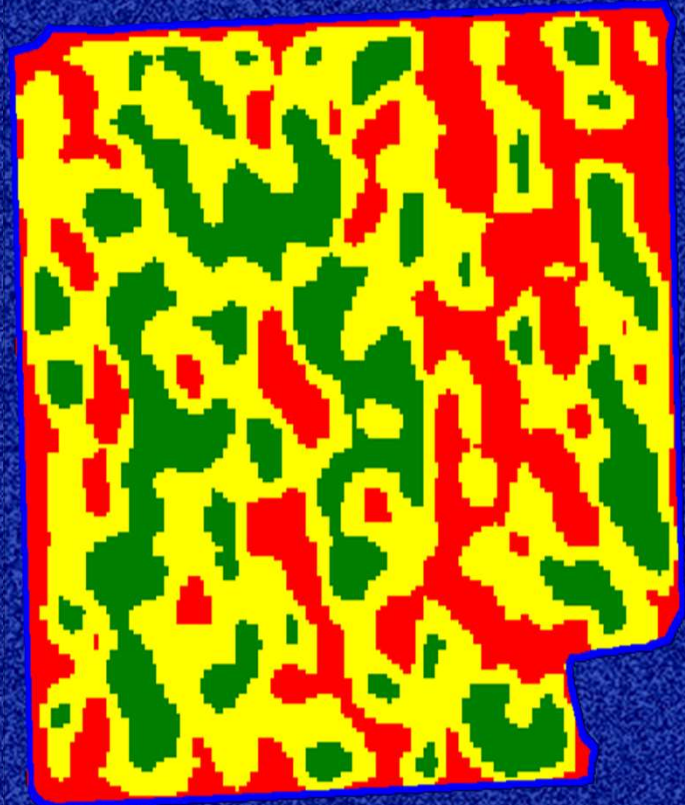
*A near infrared image of the field is taken during the growing season. The image gives an accurate reading of how dense the crop canopy is at that time.*



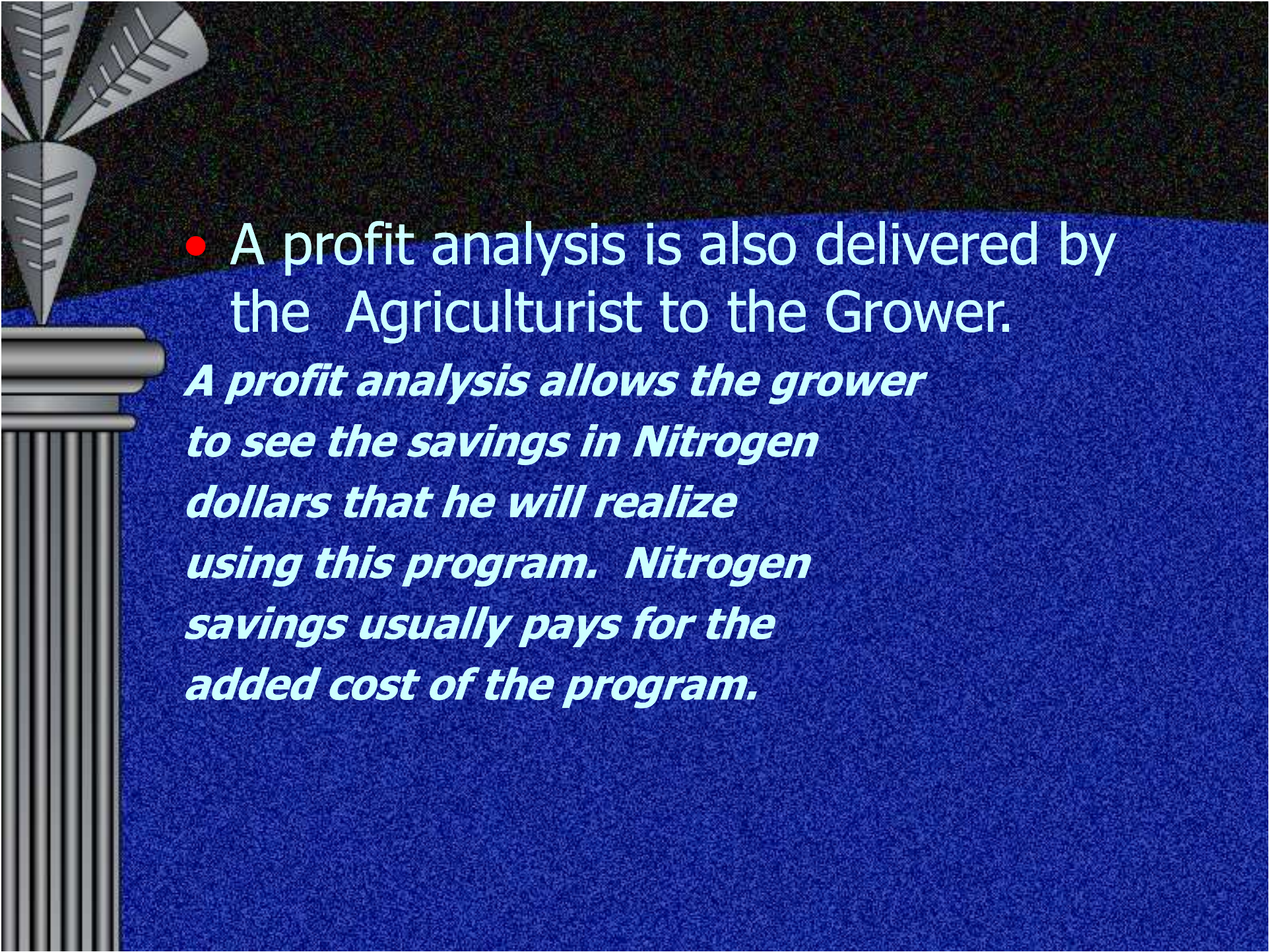


- A management zone map is then created.

*Agriculturists can create a management zone map using density levels and ground-truthing.*





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- A profit analysis is also delivered by the Agriculturist to the Grower.

***A profit analysis allows the grower to see the savings in Nitrogen dollars that he will realize using this program. Nitrogen savings usually pays for the added cost of the program.***



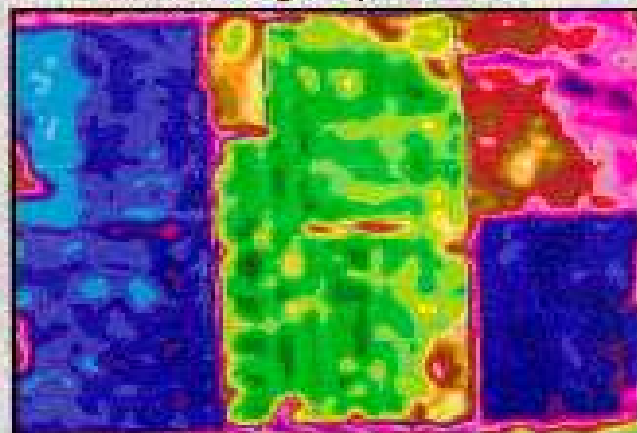
# How to Spread Less Fertilizer This Spring

## By Managing Nitrogen The Year After Your Sugarbeet Crop

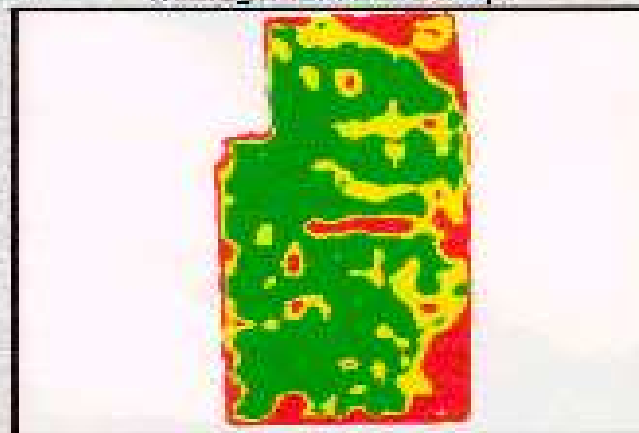
Prepared For:  
Ron Mattson

Field Information:  
County: Clay  
Township: 141 \_43  
Section: 14  
E Quarter Acres

Satellite Image Sept 5, 1988



Management Zone Map



There are many reasons to consider using nitrogen application based on sugar beet density. One reason is to reduce the amount of nitrogen that is applied without reducing yield. This will reduce input costs, and will help to prevent lodging in crops that are susceptible to that problem. Lodging can reduce a yield by up to 20 Bu/Acre. In this way, this technology will help to increase yield. Application of this type will also go a long way to preventing variability of nitrogen from becoming a problem in the years between your sugar beet crops. This map is based on the Near Infra-Red satellite image of your 1988 sugar beet crop. In some cases, a soil test of the areas of the field with the predicted low or increased bearing nitrogen may increase yields and prevent adding more N to an already high nitrogen area. Please call for details.

Wheat	Acres	Lbs. of N	45-0-0	Cost
Conventional	250.5	84767	\$1.90	\$7,550.64
Variable Rate Method				
Red Areas	51.8	16526	\$1.90	\$1,340.09
Yellow Areas	71.1	14543	\$1.90	\$1,463.24
Green Areas	127.6	26200	\$1.90	\$2,136.00
Variable Rate Totals		84574	\$1.90	\$6,139.32
Fertilizer Savings		20192		\$2,414.96

*American Crystal Sugar*






**Dan Bernardson**

Notes: Above average density's. Green a 70 lb N used to greens, and 30 to yellow



# Cost Savings

## Using Zone Spreading

46-0-0	Acres	Rate	Lbs/Required	Price/Ton	Cost
<b>Conventional</b>	157.30	326	51,293	\$230	\$5,899
	18.65	326	6,082	\$230	\$699
	37.89	261	9,884	\$230	\$1,137
	46.64	239	11,153	\$230	\$1,283
	46.13	196	9,025	\$230	\$1,038
	1.66	152	253	\$230	\$29
<b>Variable Rate Totals</b>		231	36,397	\$230	\$4,186
<b>Fertilizer Savings</b>		95	14,896	\$230	<b>\$1,713</b>



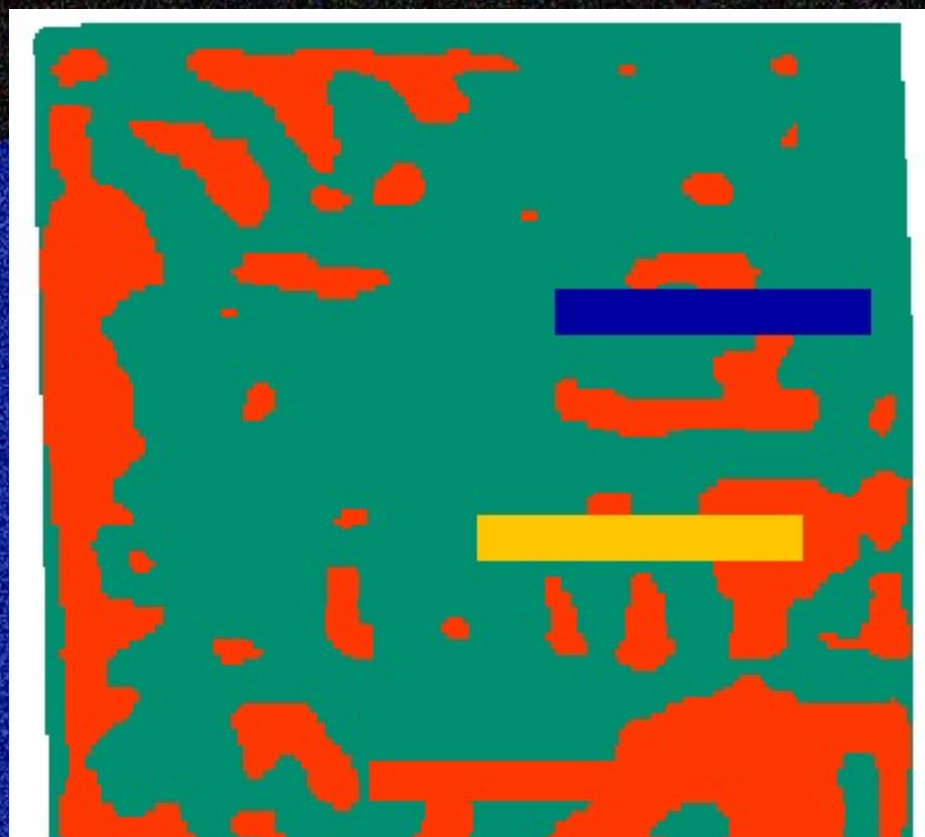
No N Credit Given  
(lodging)

N Credit Given (no  
lodging evident)

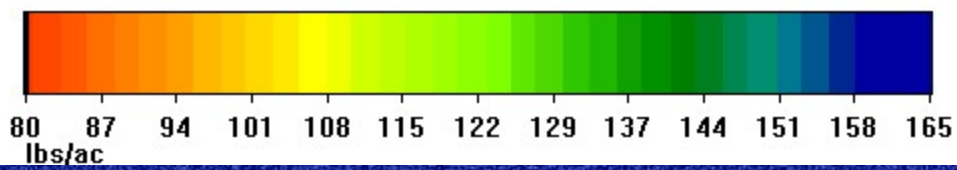




# Management zones created for 1999 Wheat using 1998 Sugarbeet images

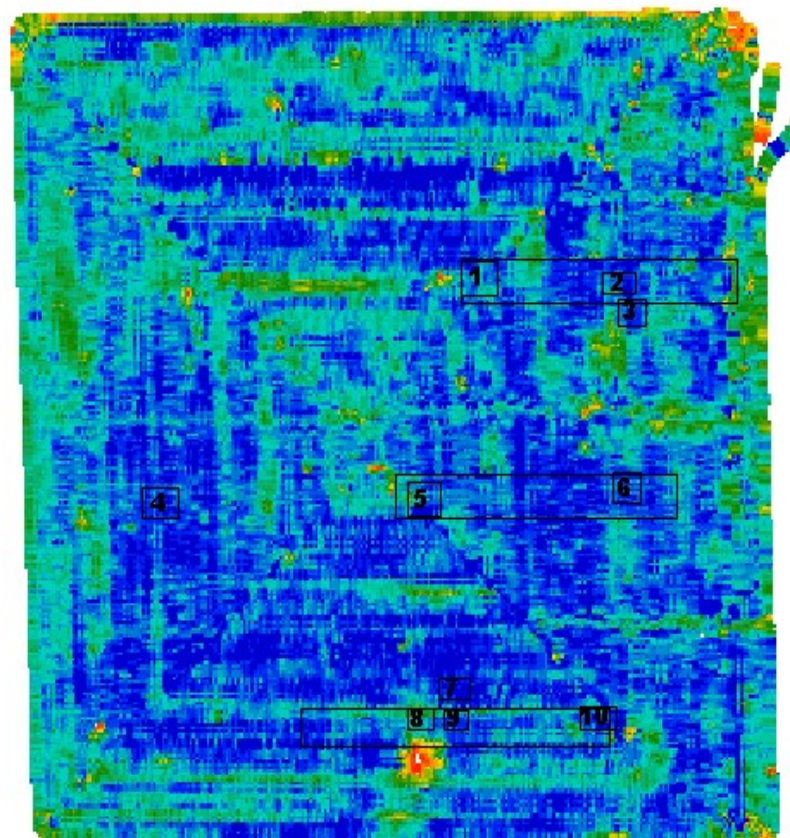


82-0-0 as Lbs of N

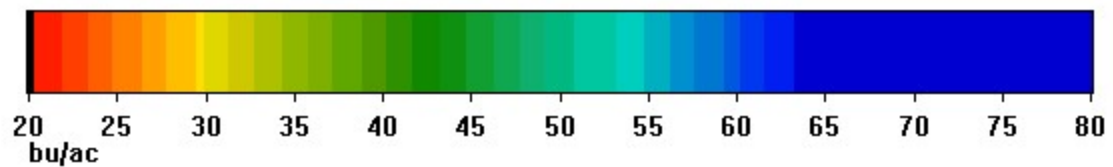




# 1999 Wheat yield map - field avg 56.35 bu/ac

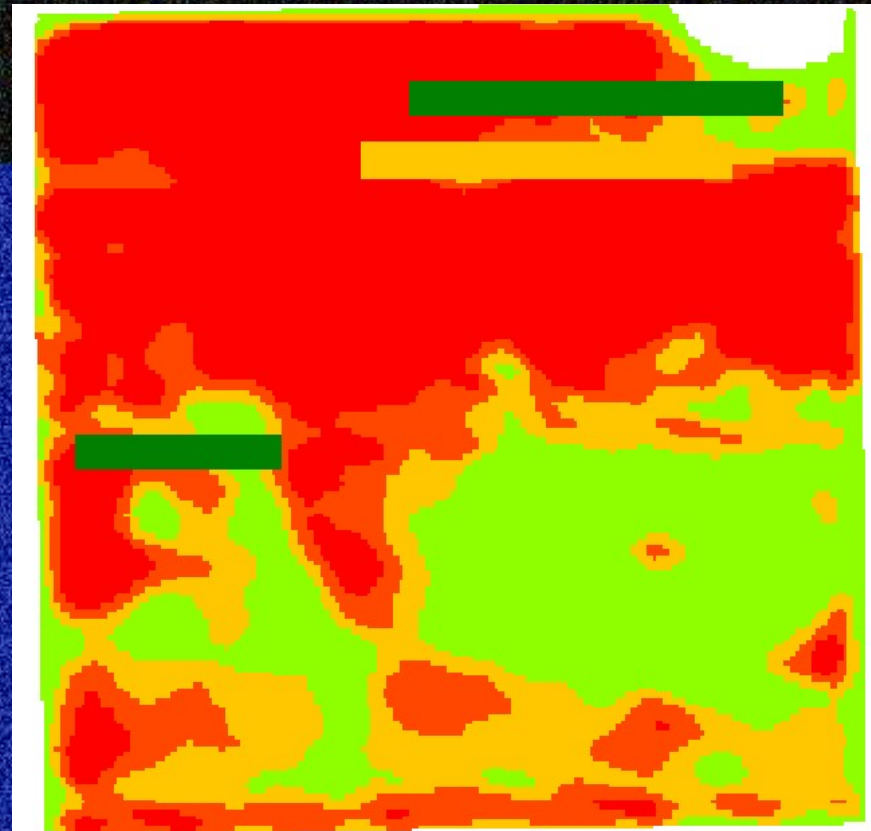


Wheat Yield

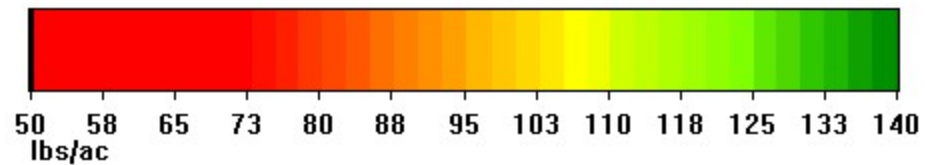




# Zones created from Sugarbeet imagery for Corn

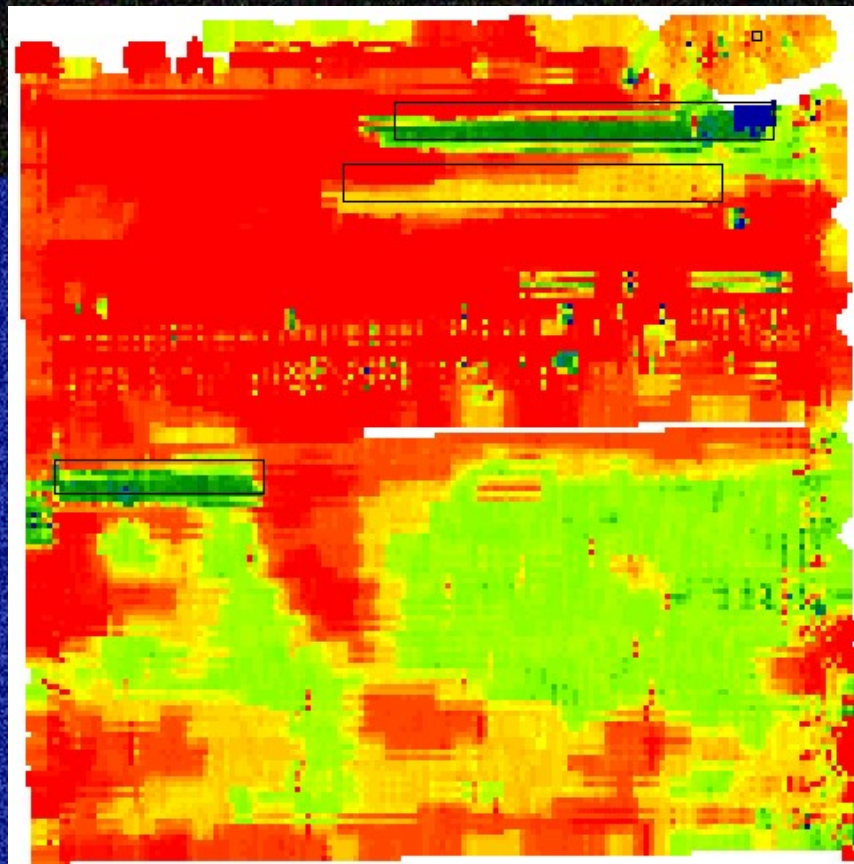


82-0-0 as Lbs of N

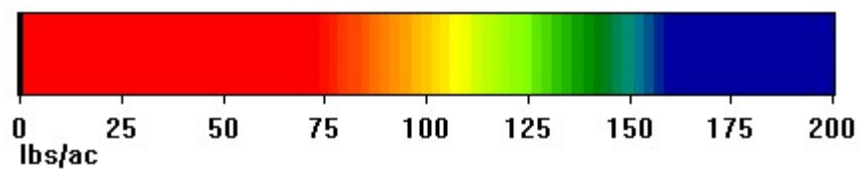




## NH<sub>3</sub> applied at variable rates

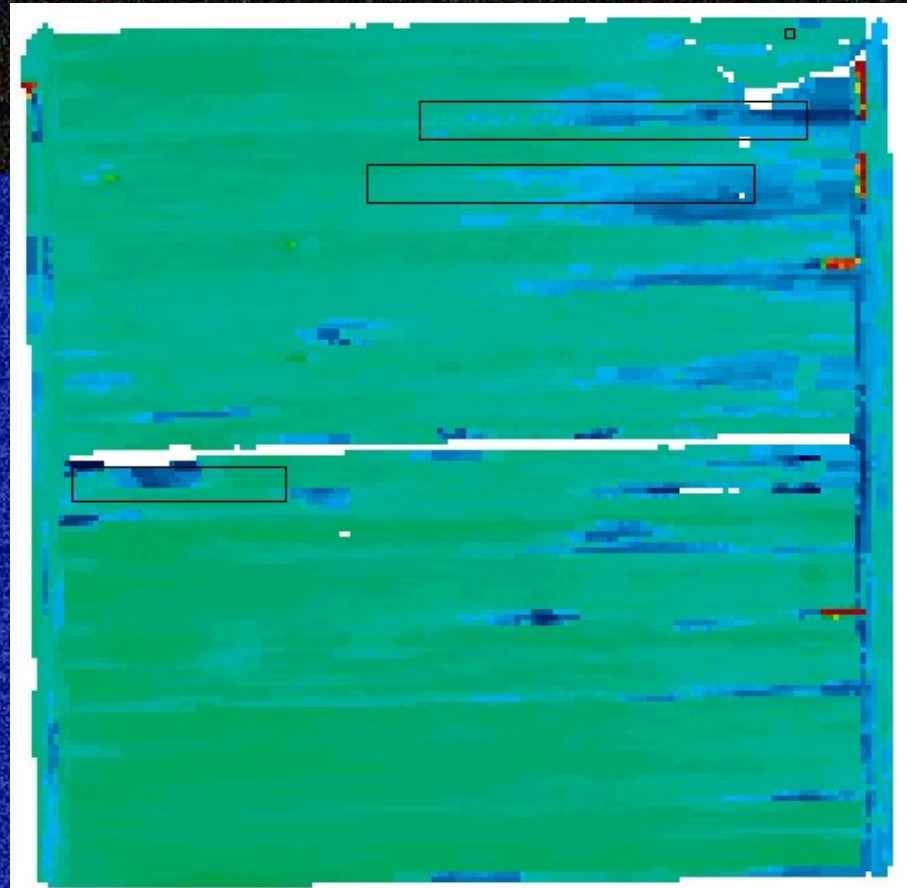


Ammonia Applied

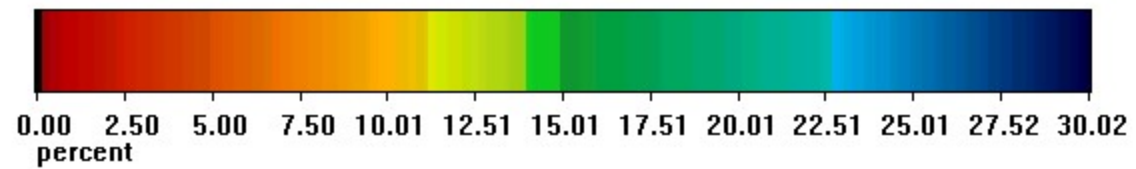




# Corn moisture map

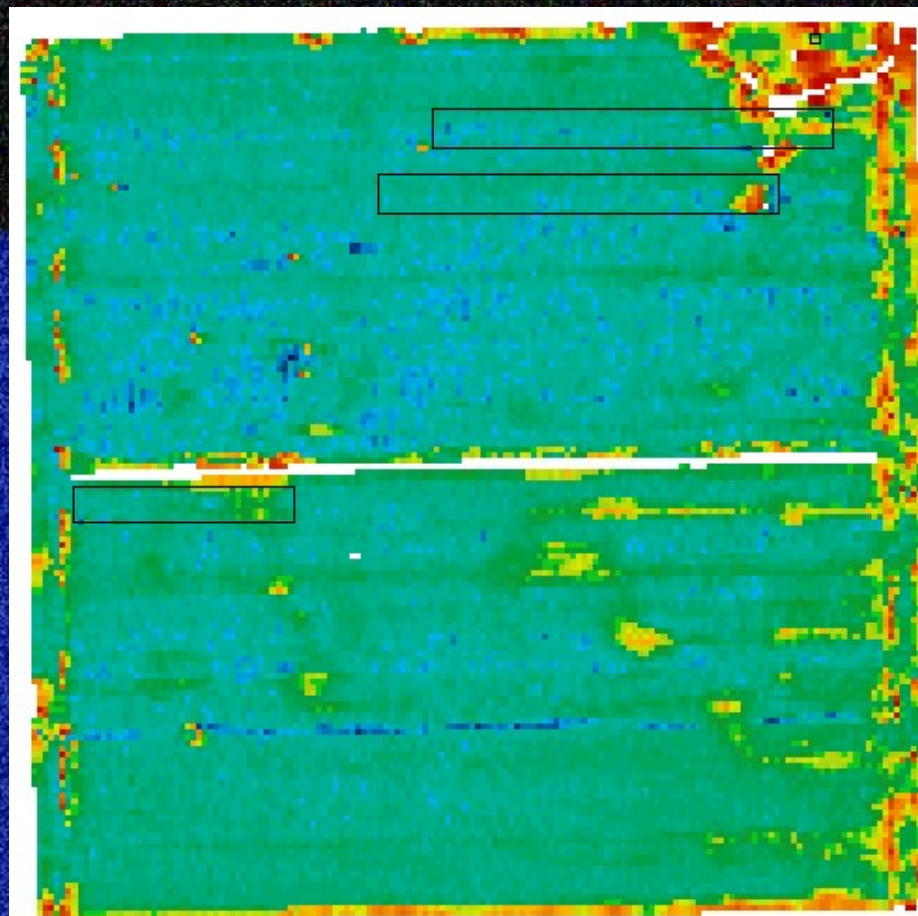


Corn Moisture

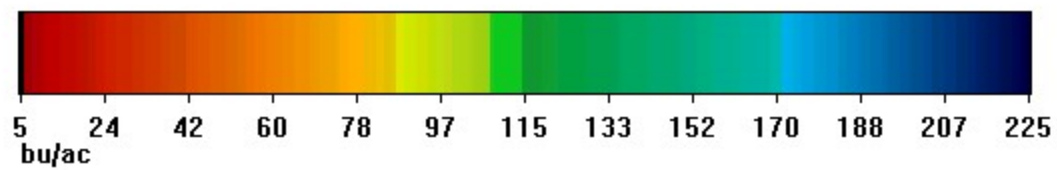




# Yield map of Corn - Field average 144.7 bu/ac



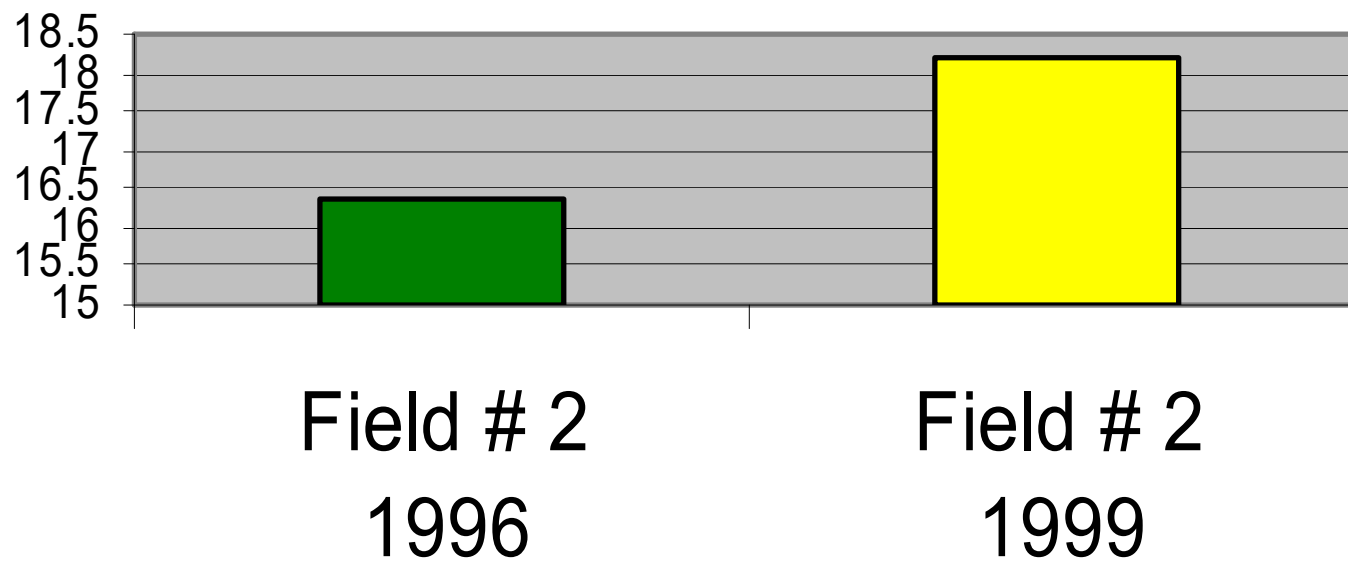
Corn Yield





# Pete Carson Farm Data

Sugar





## Pete's Farm vs. St.Thomas

Y96 - Y99 % Sugar Increase

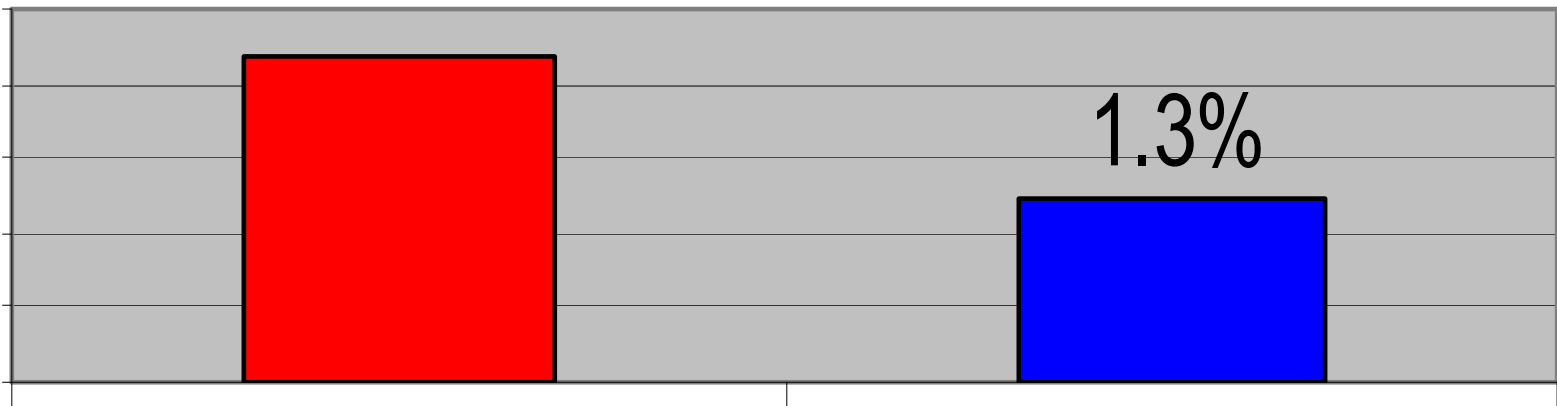
2.2%

1.3%

0.025  
0.02  
0.015  
0.01  
0.005  
0

Pete's Farm

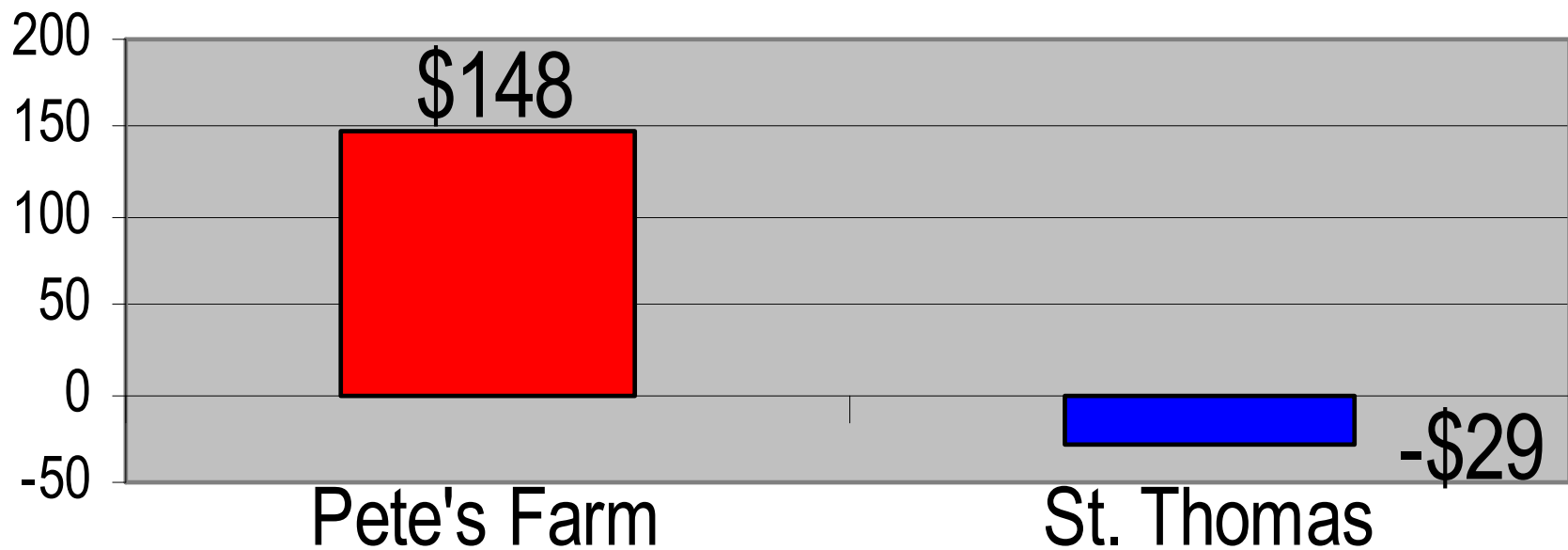
St. Thomas





# Pete's Farm vs. St.Thomas

Y 96-Y 99 \$ Increase / A







## **Grower example with 3yr rotation using precision farming methods 1999 Data**

### **Grower**

- 18.19 % sugar
- 20.8 TPA
- 1.34 SLM

### **Receiving Station**

- 17.27 % sugar
- 20.6 TPA
- 1.54 SLM

### **Revenue Difference**

- \$113.54 per Acre
- \$5.11 per Ton





## Long-Term benefits of Nitrogen management.

- Savings in Nitrogen costs.
- Improved quality in Sugarbeets.
- Improved yield and quality in wheat and barley.
  - **Higher protein.**
  - **Less Lodging.**
- Improve yield and quality in other crops.
  - **Less lodging and dry down in corn and beans.**
  - **Less disease problems caused by too dense foliage.**
- Environmentally friendly.





# Environmental

- Overapplications leach or run off
- Underapplications create reductions in crop residues which can lead to increased erosion
- Site specific farming limits soil build up of nutrients
- Fertilizer utilized more effectively rather than lost to environment.





## **We are involved because....**

- Mutually beneficial to our growers and company
- Shareholders need more info for better decisions
- ACSC needs a quality product
- No missed opportunities



# Questions and Answers



American Crystal Sugar Company