Irrigated NCCPI

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Robert Dobos
National Soil Survey Center

Introduction

- In order to provide for equitable treatment of producers there is a need to array the soils of the US on the basis of their capacity to produce commodity crops under irrigation
- The Irrigated National Commodity Crop Productivity Index is being developed to meet that need

Background

- The National Soil Information System is the data source for the model, which provides consistent data across the US
- This allows consistent criteria to be applied across large geographic areas to maintain fairness
- NASIS uses a fuzzy system to calculate interpretive results
- We can say "It absolutely true that a soil having a pH of 6.5 in the depth from 0 to 20 cm is in the set of very productive soils"
- The model uses more or less use independent soil properties from the soil survey database
- It is assumed that irrigation water is present

Hypothesis

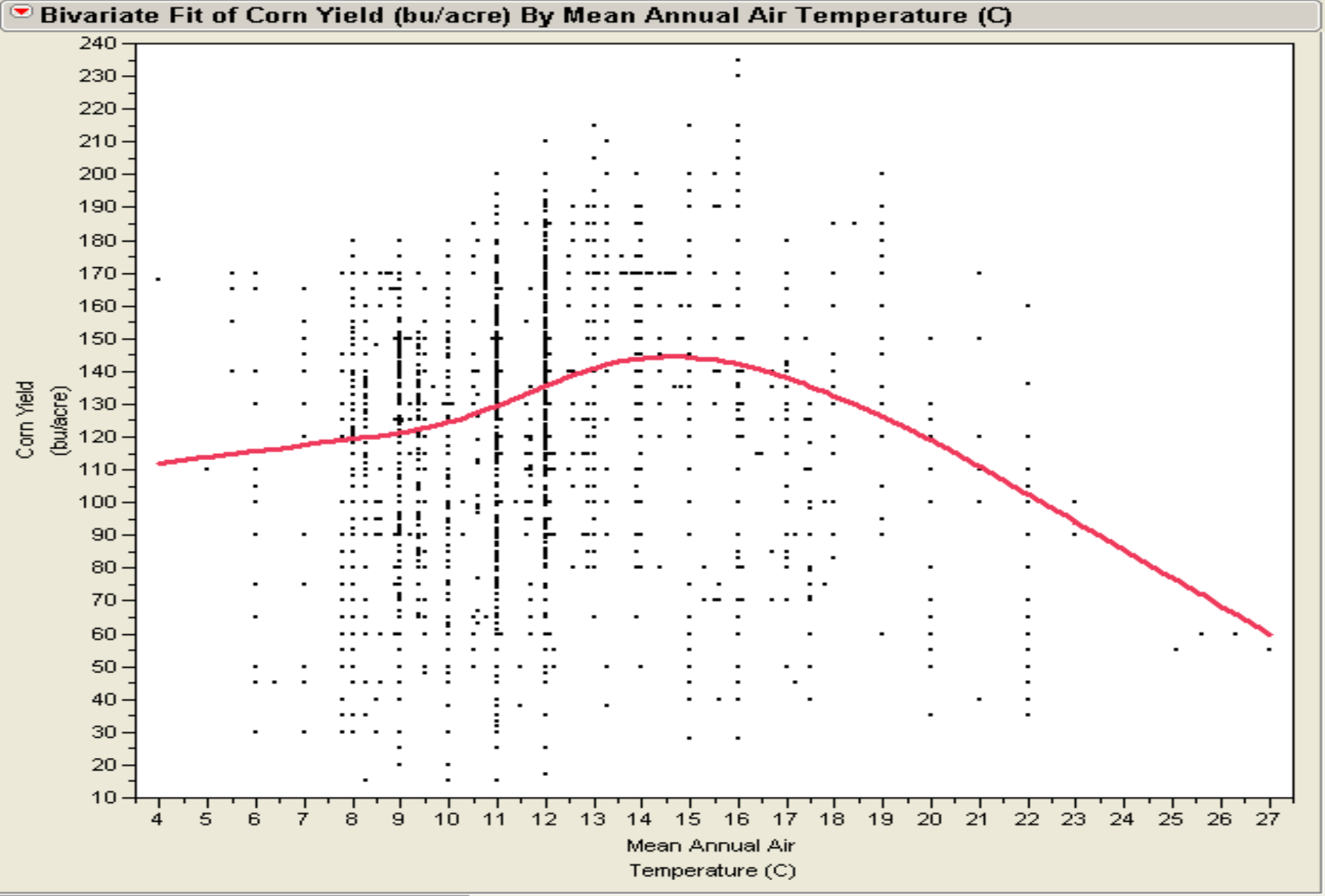
- "The Soil Survey database can be used to develop a satisfactory model to array soils based on their inherent productivity under irrigation"

Methods

- Examine soil, site, and climate properties individually to determine their correlation to irrigated yield of selected commodity crops: corn, wheat, cotton
- Assemble the important properties and account for interaction
- The overall model consists of three subrules: corn and soybeans, cotton, and small grains
- Evaluate the results

Soil, Site, and Climate Properties

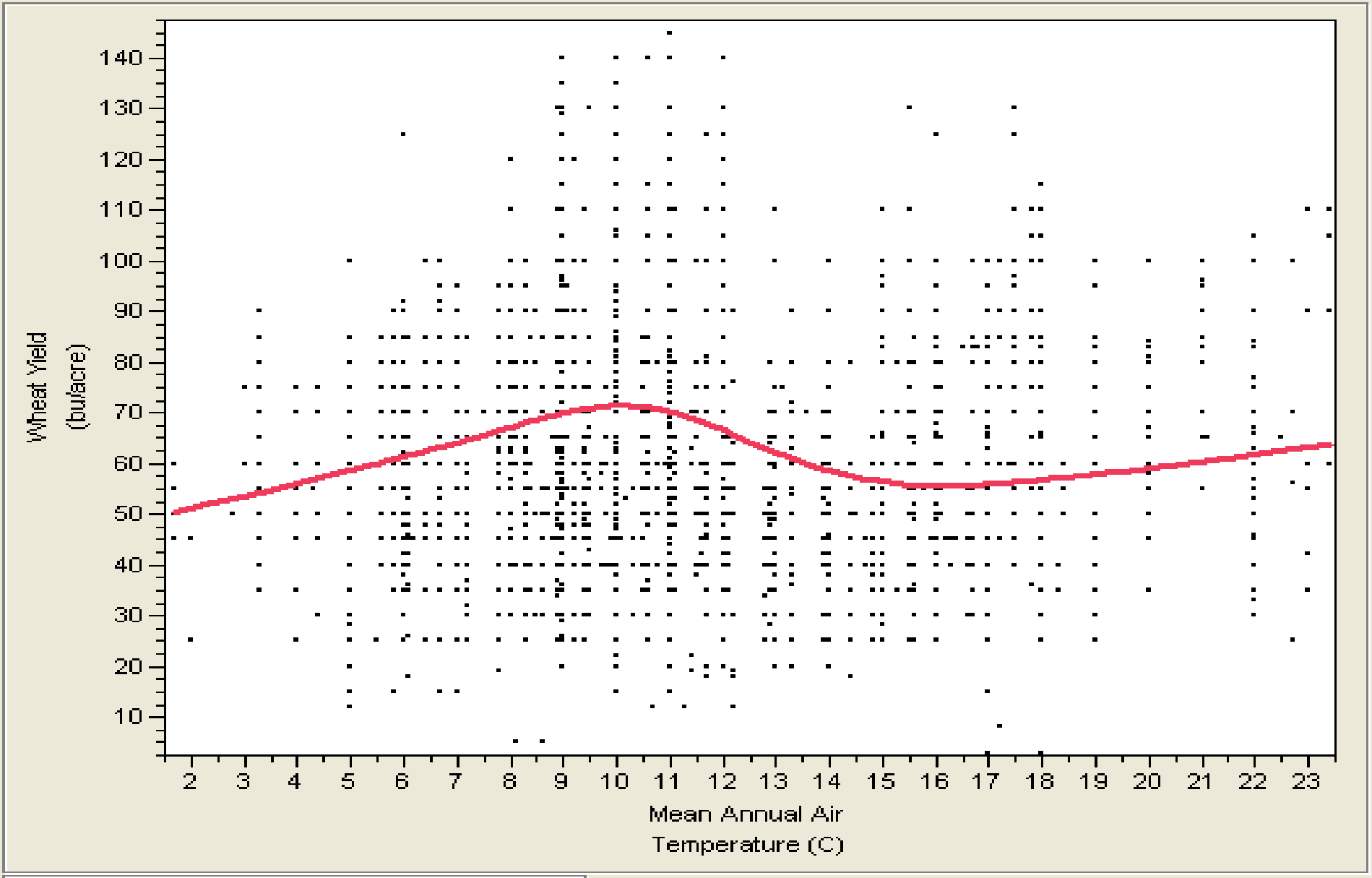
- Hydraulic conductivity
- Cation Exchange Capacity
- Bulk Density
- Electrical Conductivity
- pH
- Linear extensibility
- Organic matter content
- Rooting zone depth
- Mean Annual Air Temperature
- Frost Free Days
- Mean Annual Precipitation
- Flooding
- Ponding
- Water Table
- Slope
- Rock fragment content



Smoothing Spline Fit, lambda=10000

R-Square 0.101835

Bivariate Fit of Wheat Yield (bu/acre) By Mean Annual Air Temperature (C)

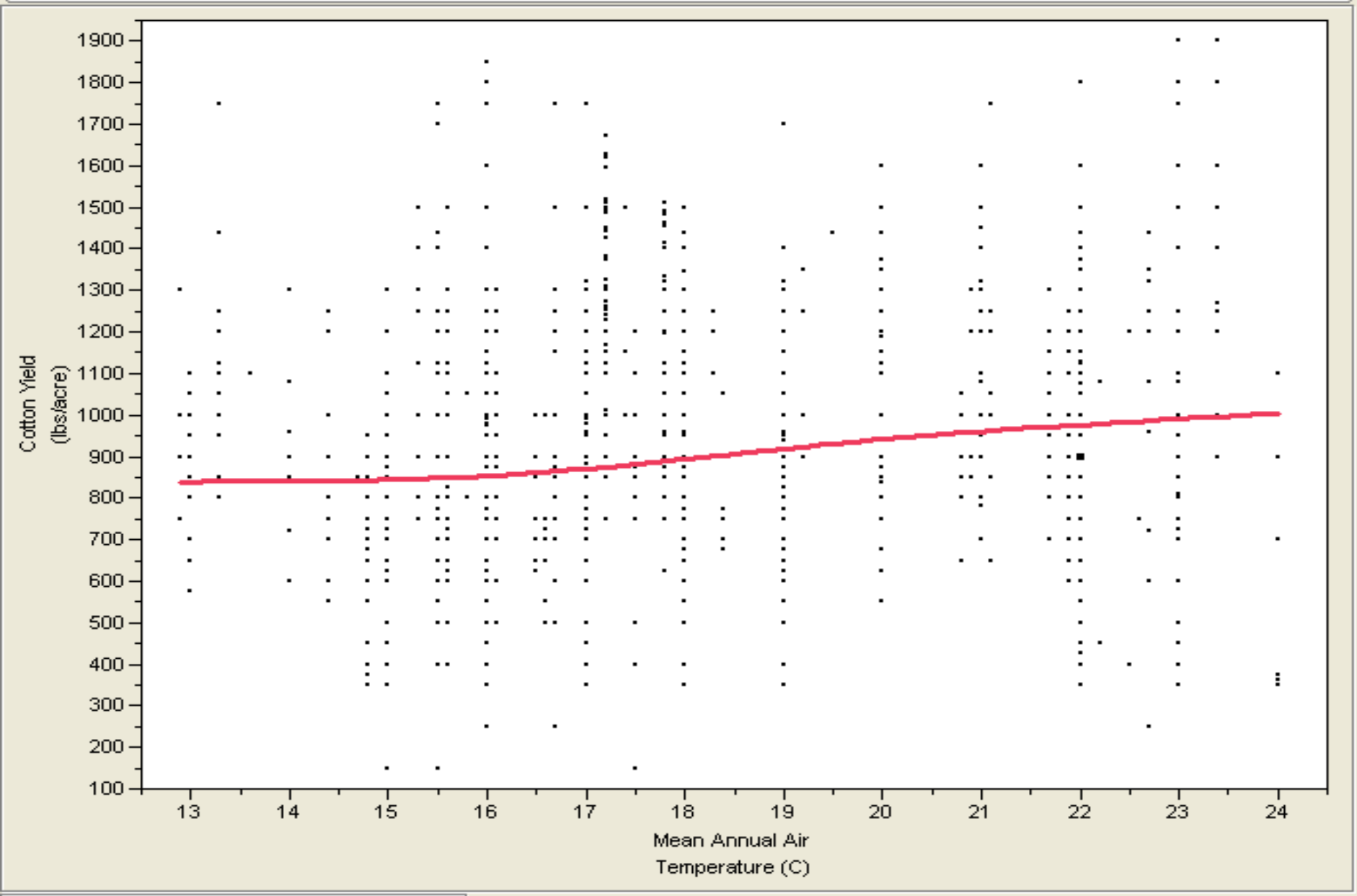


Smoothing Spline Fit, lambda=15441.14

Smoothing Spline Fit, lambda=15441.14

R-Square 0.109457

Bivariate Fit of Cotton Yield (lbs/acre) By Mean Annual Air Temperature (C)

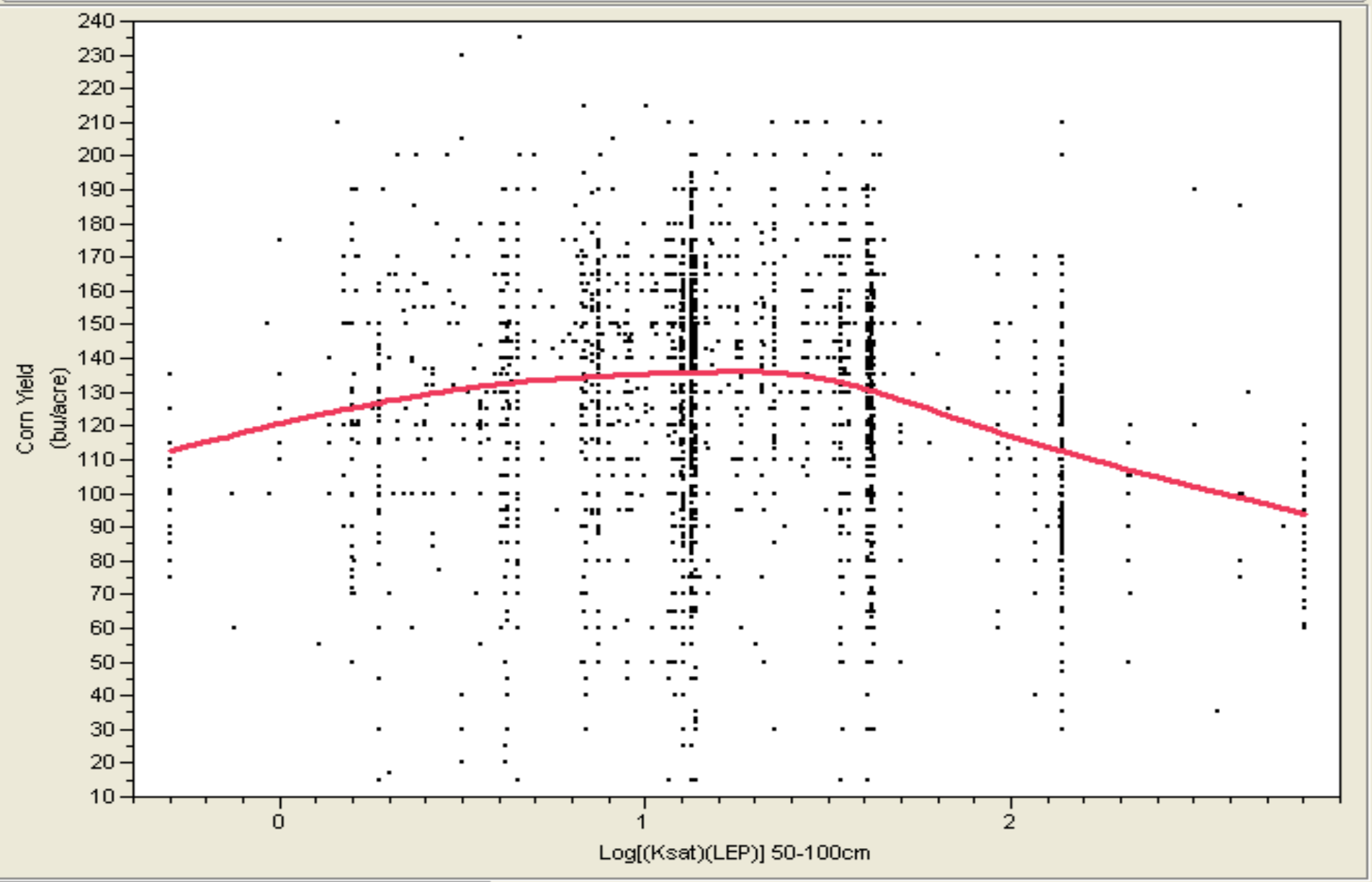


Smoothing Spline Fit, lambda=15441.14

Smoothing Spline Fit, lambda=15441.14

R-Square 0.039981

Bivariate Fit of Corn Yield (bu/acre) By Log[(Ksat)(LEP)] 50-100cm

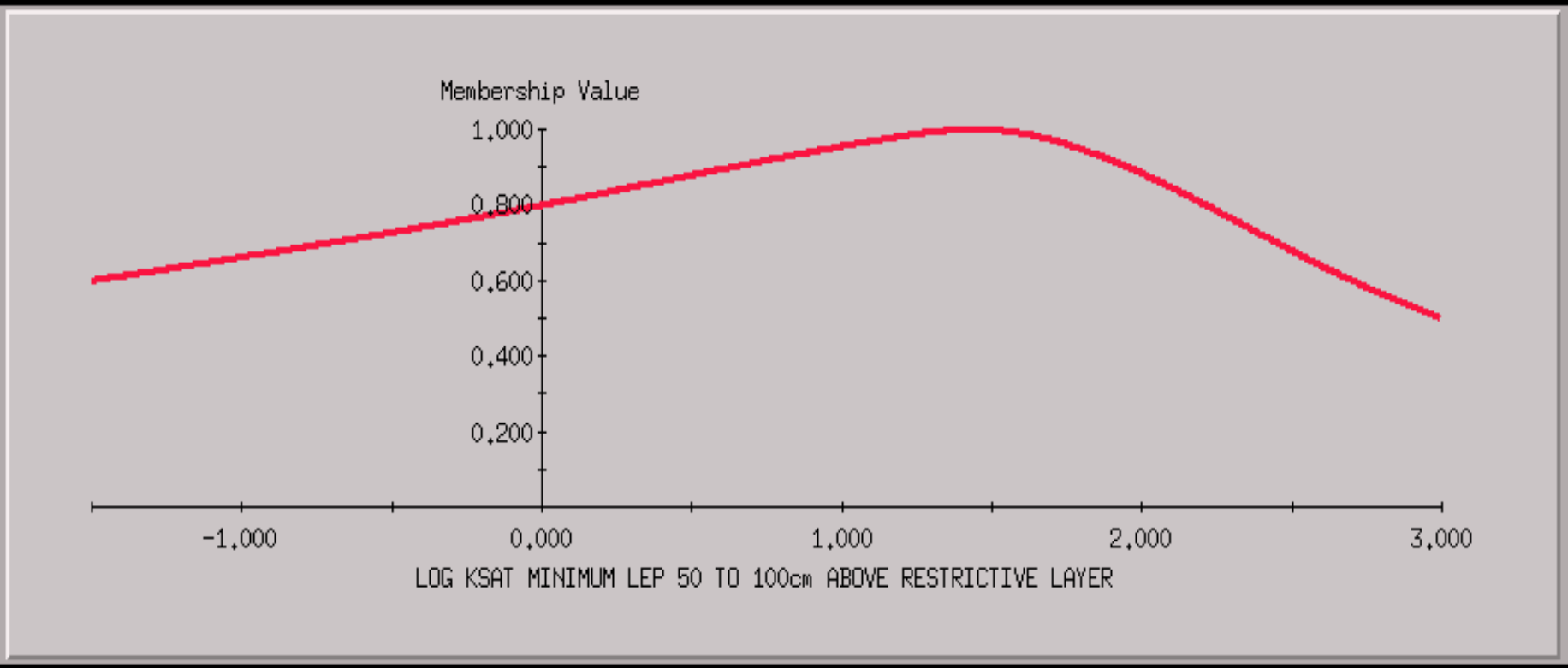


Smoothing Spline Fit, lambda=10.44403

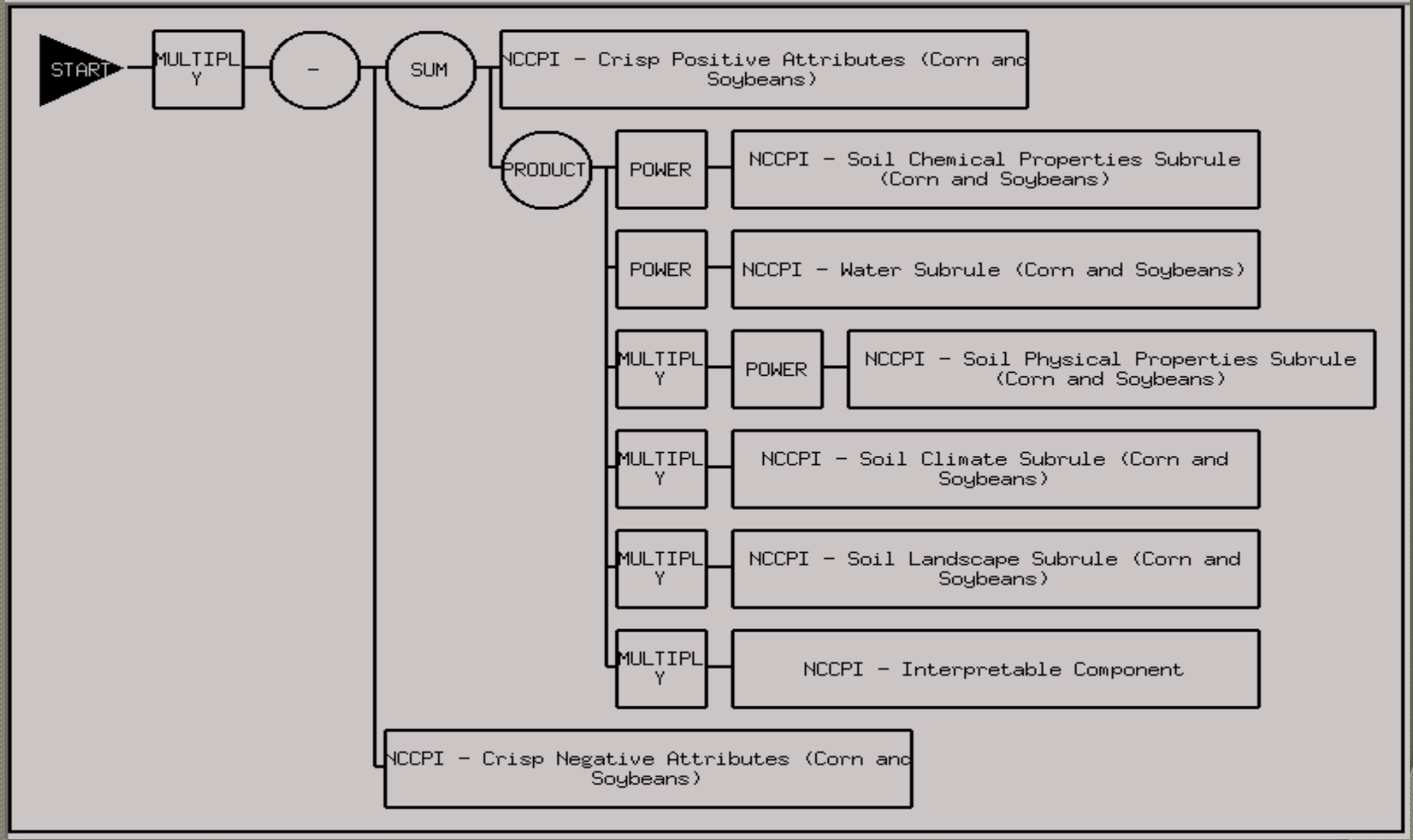
Smoothing Spline Fit, lambda=10.44403

R-Square 0.071034

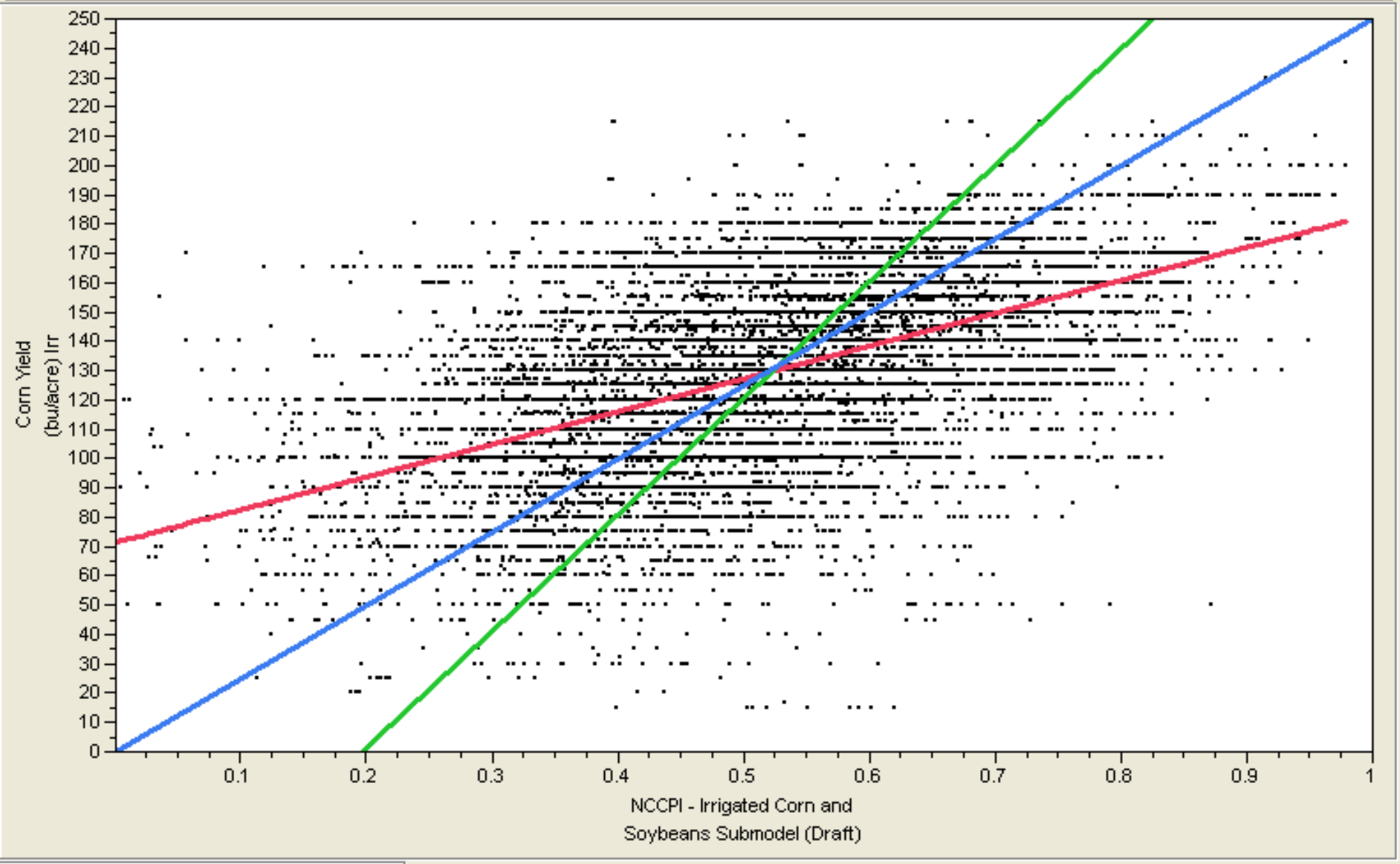
A fuzzy set


Membership Value
1.000
0.800
0.600
0.400
0.200
-1.000
0.000
1.000
2.000
3.000
LOG KSAT MINIMUM LEP 50 TO 100cm ABOVE RESTRICTIVE LAYER

A Corn and Soybeans Subrule



Bivariate Fit of Corn Yield (bu/acre) Irr By NCCPI - Irrigated Corn and Soybeans Submodel (Draft)



Smoothing Spline Fit, lambda=100000
Orthogonal Fit Ratio=0.000
Linear Fit

Smoothing Spline Fit, lambda=100000

R-Square	0.281569

Conclusions

- Addition of irrigation water greatly reduces the significance of many soil properties in determining the productivity of a soil
- Soils can be arrayed on the basis of their inherent properties but management is the primary factor except in extreme situations

Questions?