

A wide-angle photograph of a tobacco field. The plants are in the foreground and middle ground, showing large, green, slightly yellowed leaves. The field extends to a line of trees in the background under a bright, slightly cloudy sky.

Tobacco Crop Monitoring in a Deficit Irrigation Study

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Objectives

- Determine if different irrigation management protocols cause significant changes in the tobacco leaf chemistry
- Investigate ion movement in the soil profile
- The long-term goal is to align production practices with tobacco specifications and increase production efficiencies

Can a complex analysis of the data uncover additional findings previously unknown?

Irrigation Treatments

- Treatment 1: Full Irrigation (FC - 25% Deficit)
- Treatment 2: Deficit Irrigation (50% - 75% Deficit)
- Treatment 3: Swing Irrigation (FC - 75% Deficit)
- Treatment 4: Traditional Irrigation

FC = Field Capacity

Deficit = Percentage Reduction of Available Water







Tobacco Crop Monitoring Project

Irrigation Treatment	No. of irrigation events	Hrs. of irrigation	Water applied (in.)	Water per event (in.)
Full Irrigation	123	58.5	6.32	0.05
Deficit Irrigation	53	26.7	2.88	0.05
Swing Irrigation	22	58.2	6.28	0.29



June 15, 2011

Data Collected

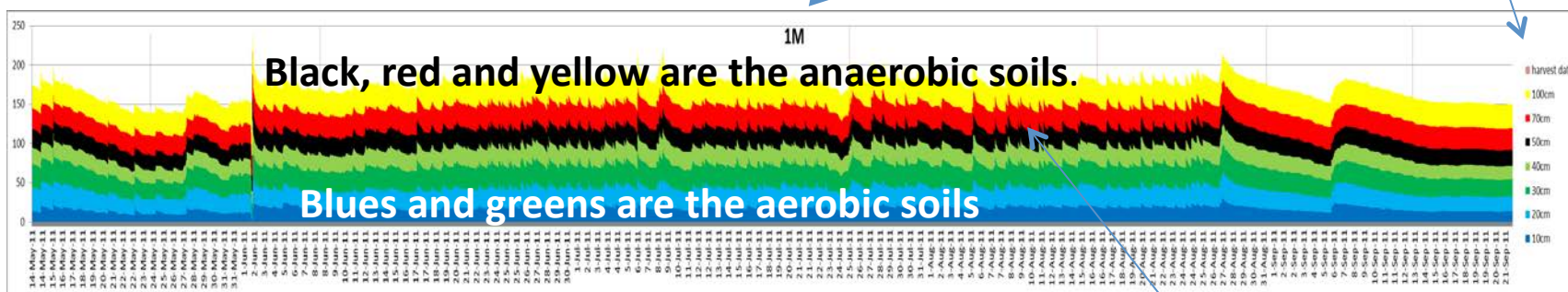
- Soil Data
 - Soil Moisture (Percent; Volumetric Content)
 - Soil Ions (Siemens/cm; Conductivity)
 - 10, 20, 30, 40, 50, 70 and 100 cm
(4, 8, 12, 16, 20, 28 and 40 inches)
- Weather data
 - Temp, Relative Humidity, Solar Radiation, Wind Speed, Rainfall
 - Heat Units, ETo are Calculated from Data

How to Read Visually Enhanced TX Graphs

The scale is determined from probe readings in volumetric percent (moisture) or Siemens/cm (ions)

Treatment # and type of reading

Soil depths where data were collected



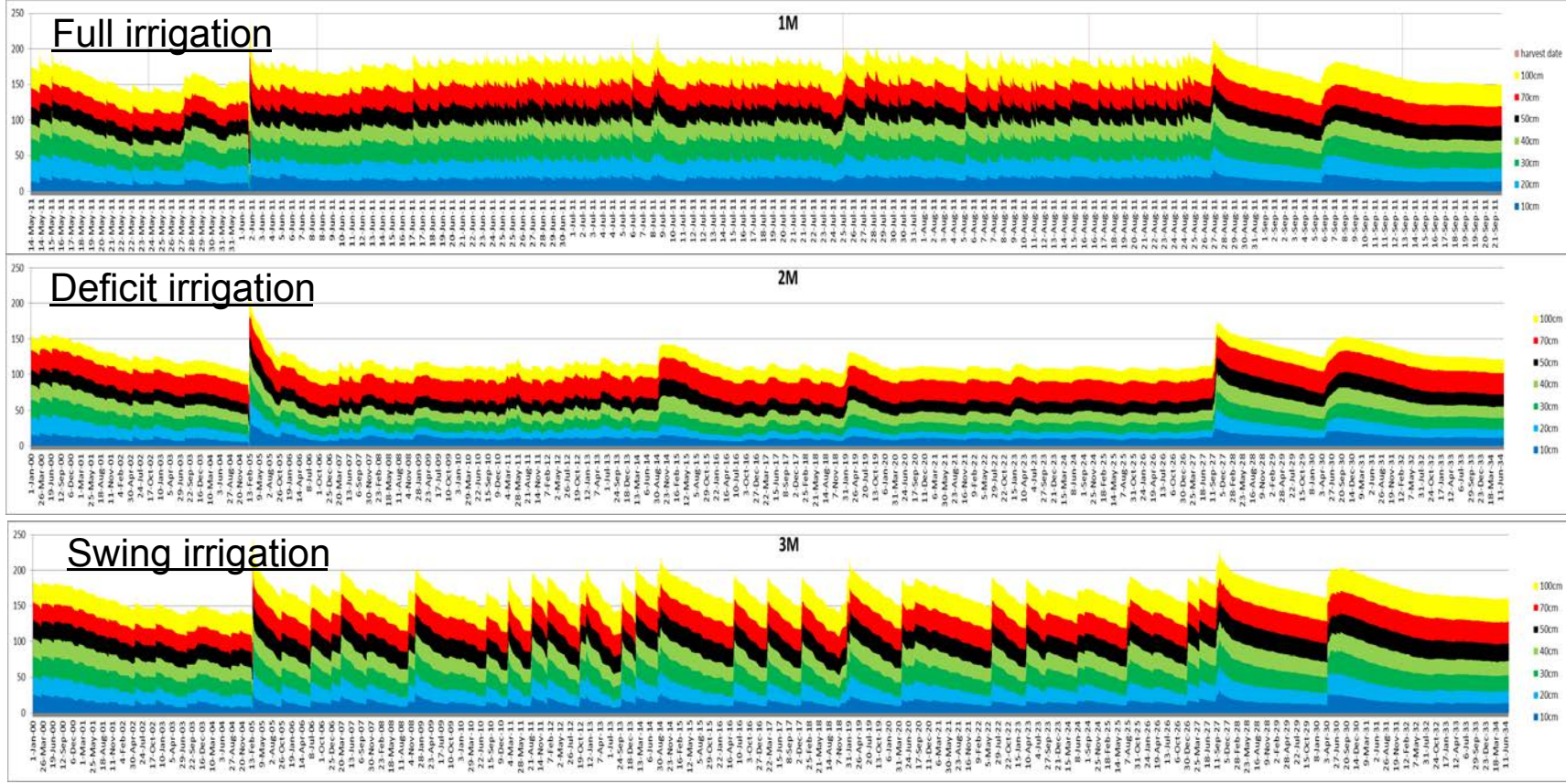
Date when data were collected

Data collected every 15 minutes

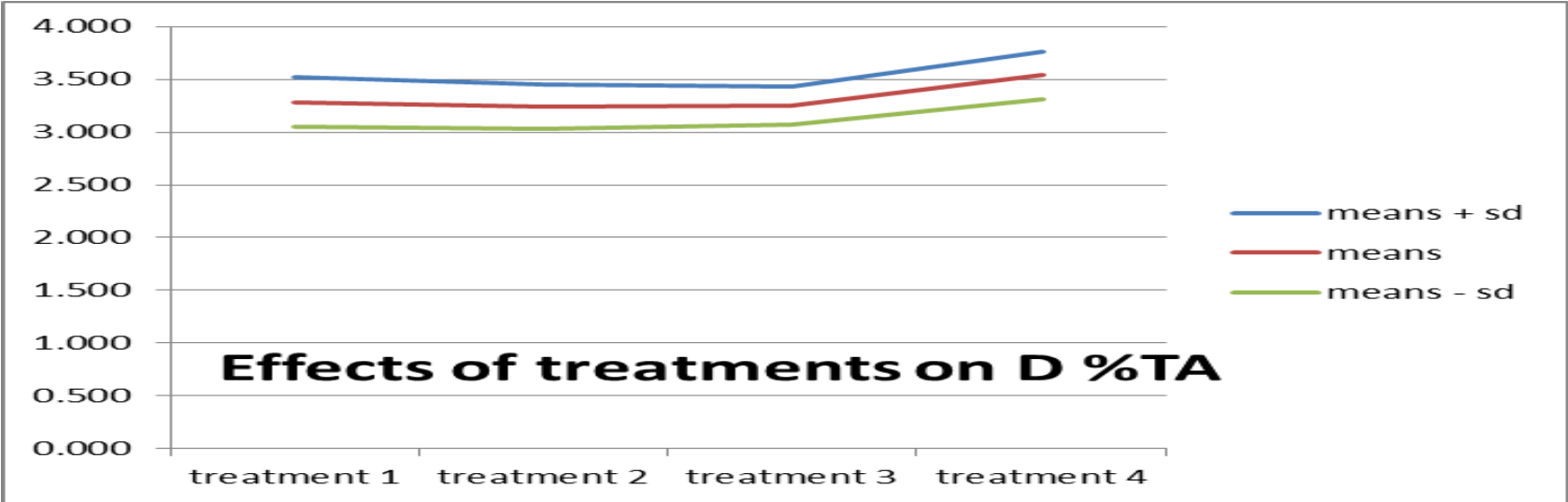
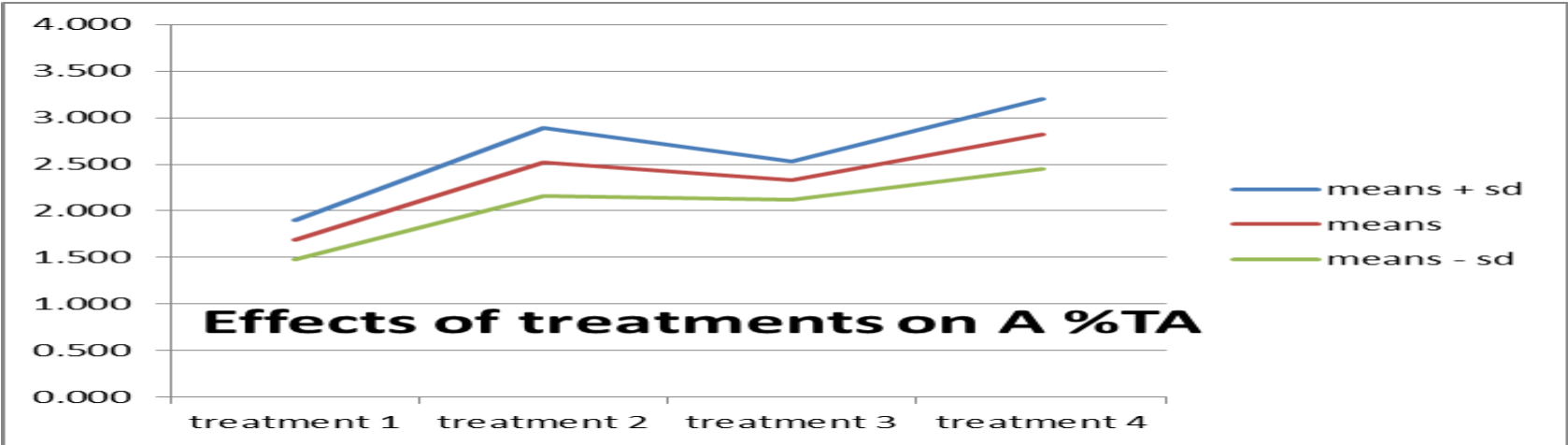
The color bands are displayed in order of the depths the data are collected (from shallow to deep)

The thicker the color band, the greater the amount of water or ions

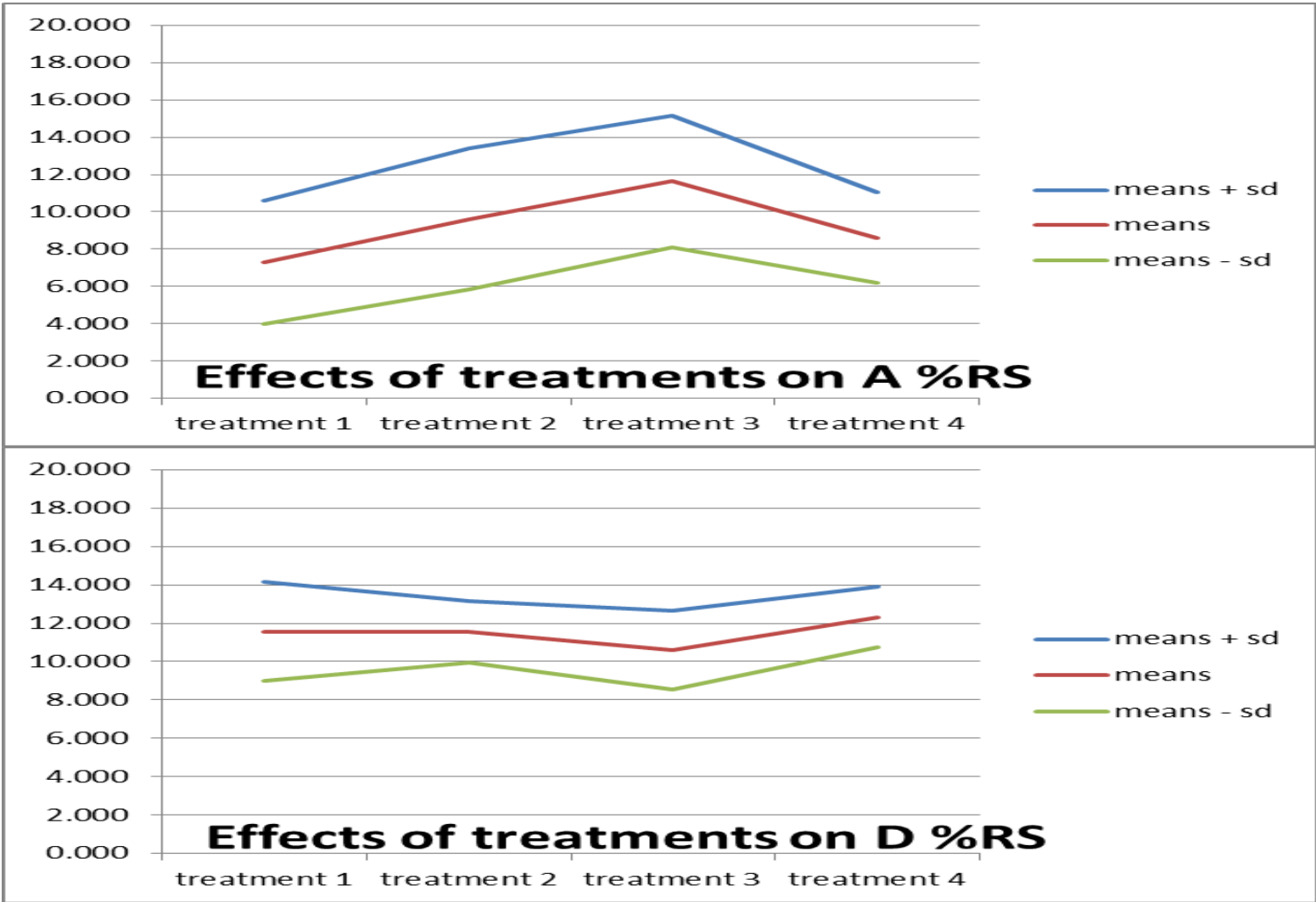
Soil Moisture Treatments 1 - 3



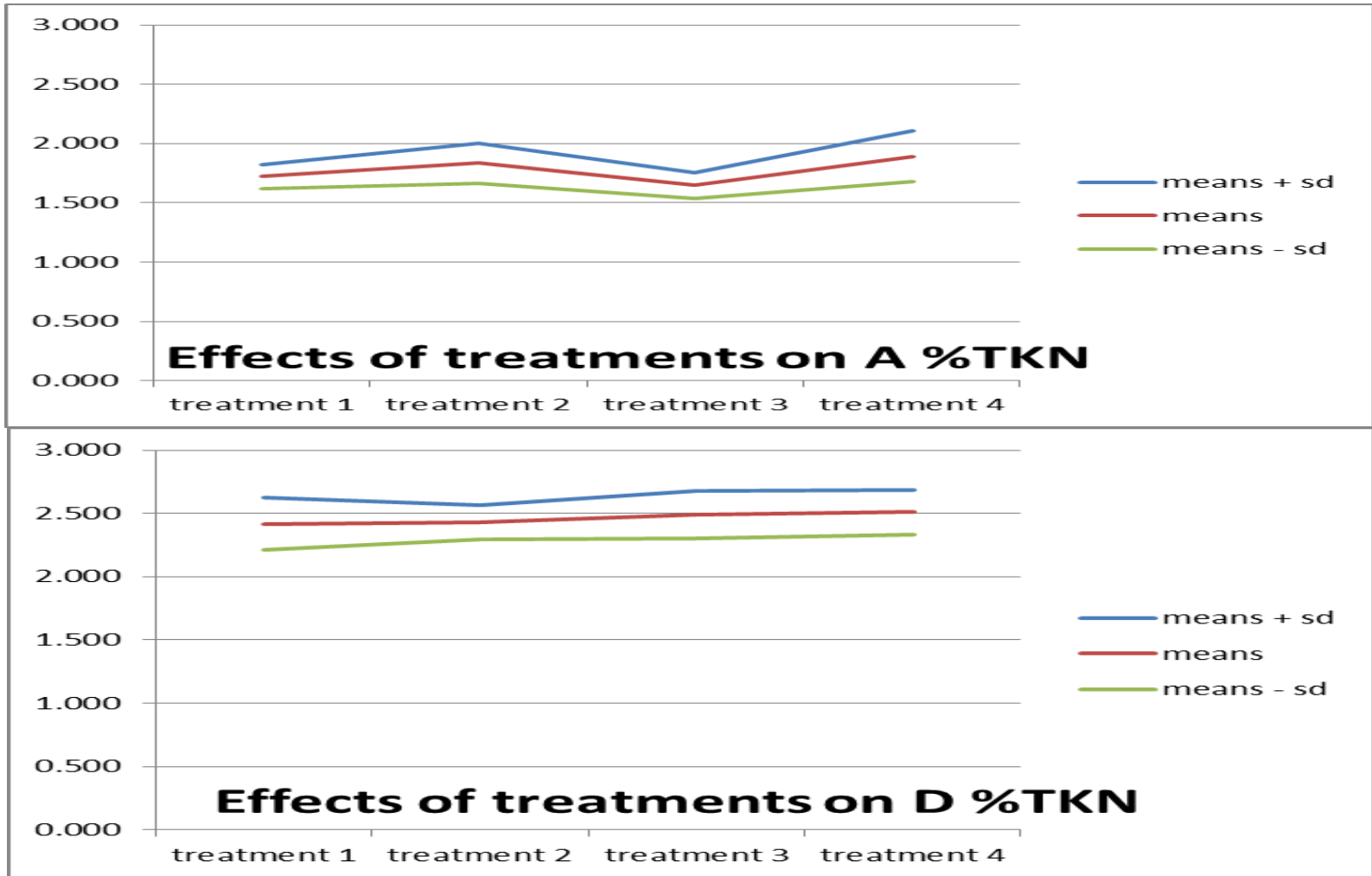
% TA: First and Last Harvest



% RS: First and Last Harvest



% TKN: First and Last Harvest

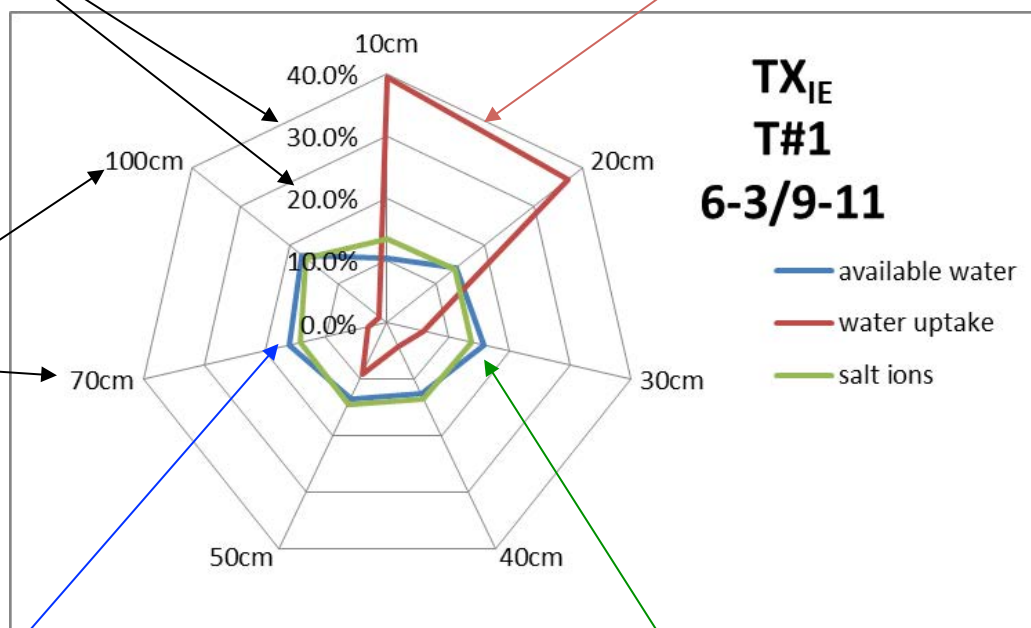


How to Read Visually Enhanced TX_{IE} Graphs

The inner rings represent what percent of the season total occurred at each level

The spoke is the depth where the data were collected

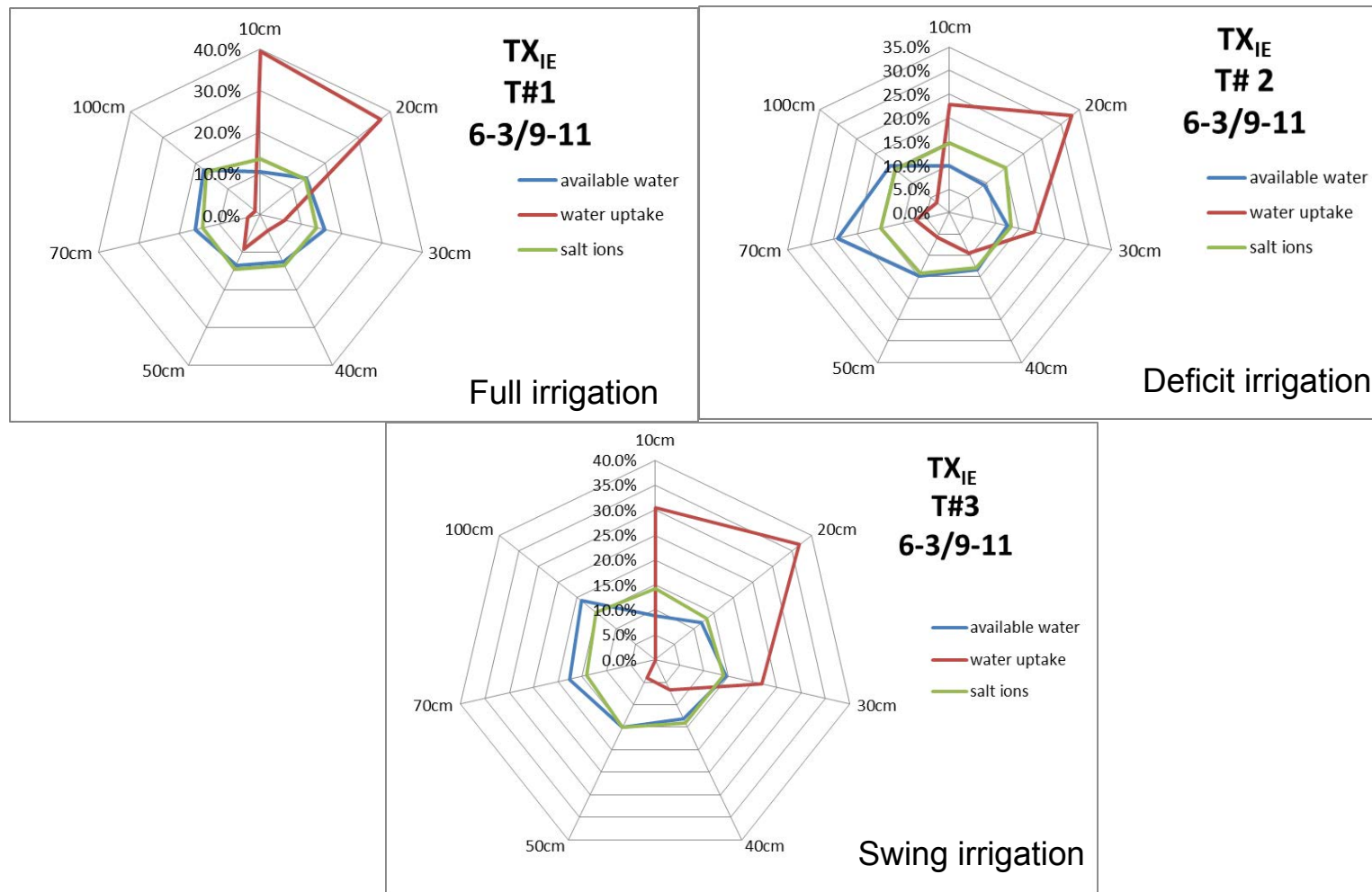
The red line indicates where water left the profile by plant uptake or surface evaporation



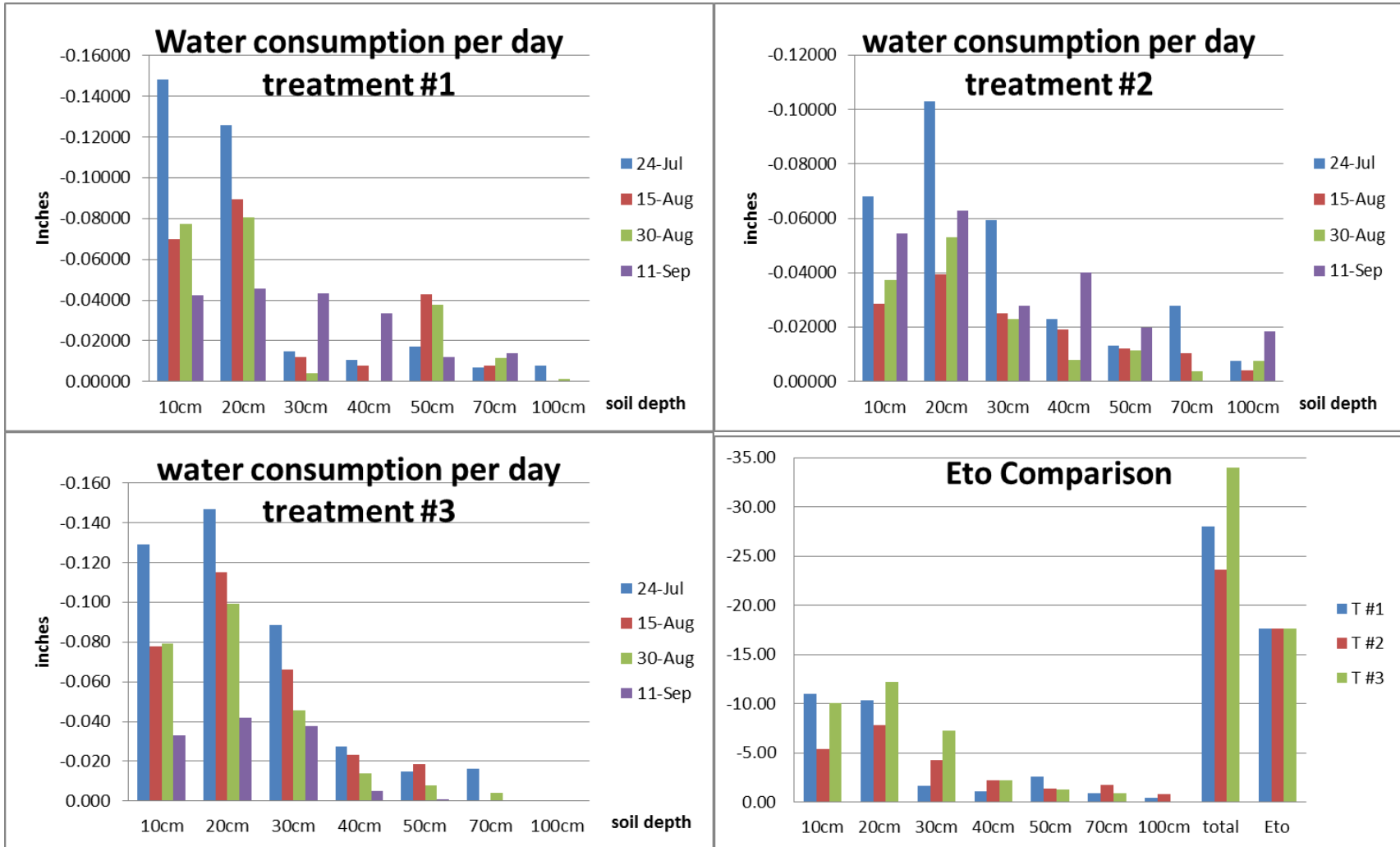
The blue line shows available water content at each depth over the entire season

The green line shows salt ion content at each depth over the entire season

Where was the water? Where were the salt ions? Where did the roots take up water? Were there any differences among treatments?



Water Consumption and ETo



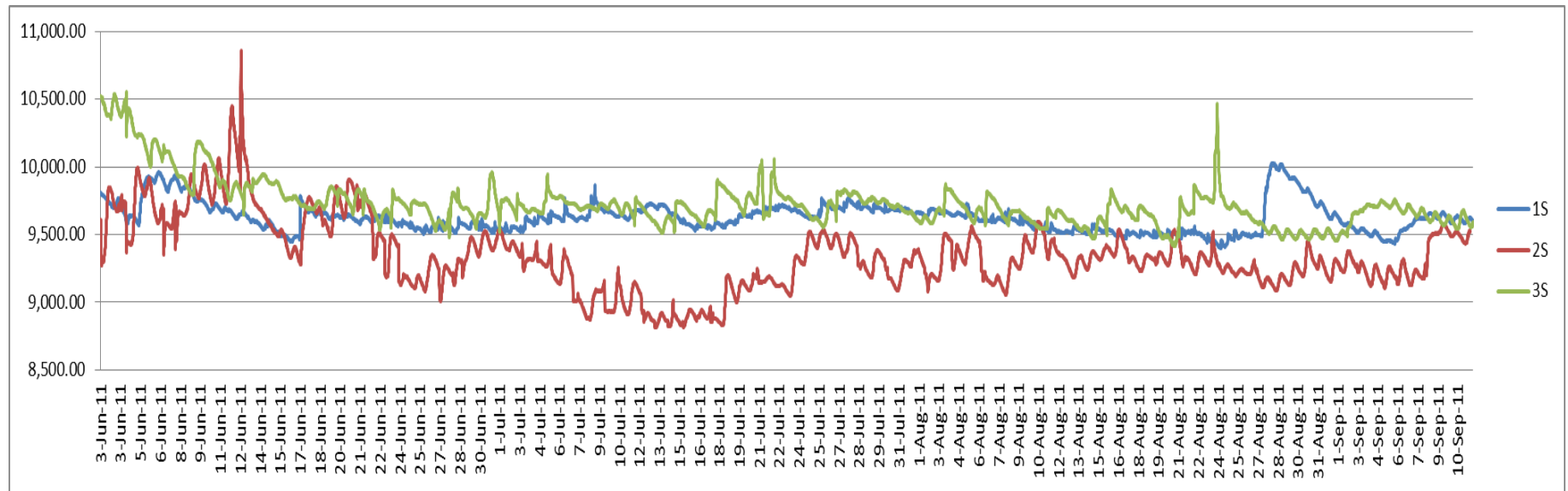
Irrigation Summary

- Irrigation management does make a difference in tobacco leaf chemistry in the absence of rain
- The tobacco crop slowed down (Treatments 1 & 3) or accelerated (Treatment 2) after first harvest when a major rain occurred
- If enough water is applied before final harvest the tobacco crop leaf chemistry can readjust

Salt Ion Technology

- Earthtec Solutions' current technology can measure salt ions as well as moisture; the salt ions were located below the active root zone
- Salt ion readings can be easily converted to EC
- Most fertilizers have salt ions; if irrigation water is not saline, the salt ions reflect fertilizer placement
- This year, Earthtec Solutions mapped ions; next year soil water samples can be collected and analyzed for specific ion concentrations

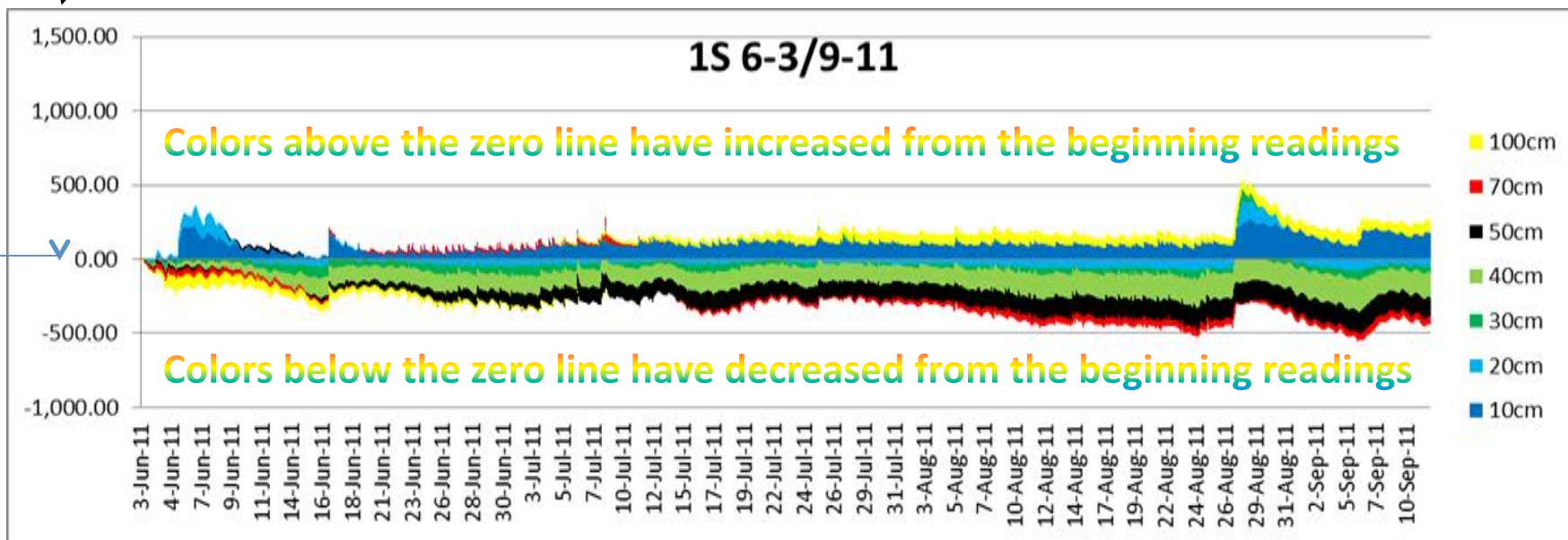
Salt Ion Comparison - Full Season



- The traditional display of soil ion data at three different irrigation programs provides plenty of data but no analysis
- Interpretation without additional analysis leads to an ambiguous conclusion

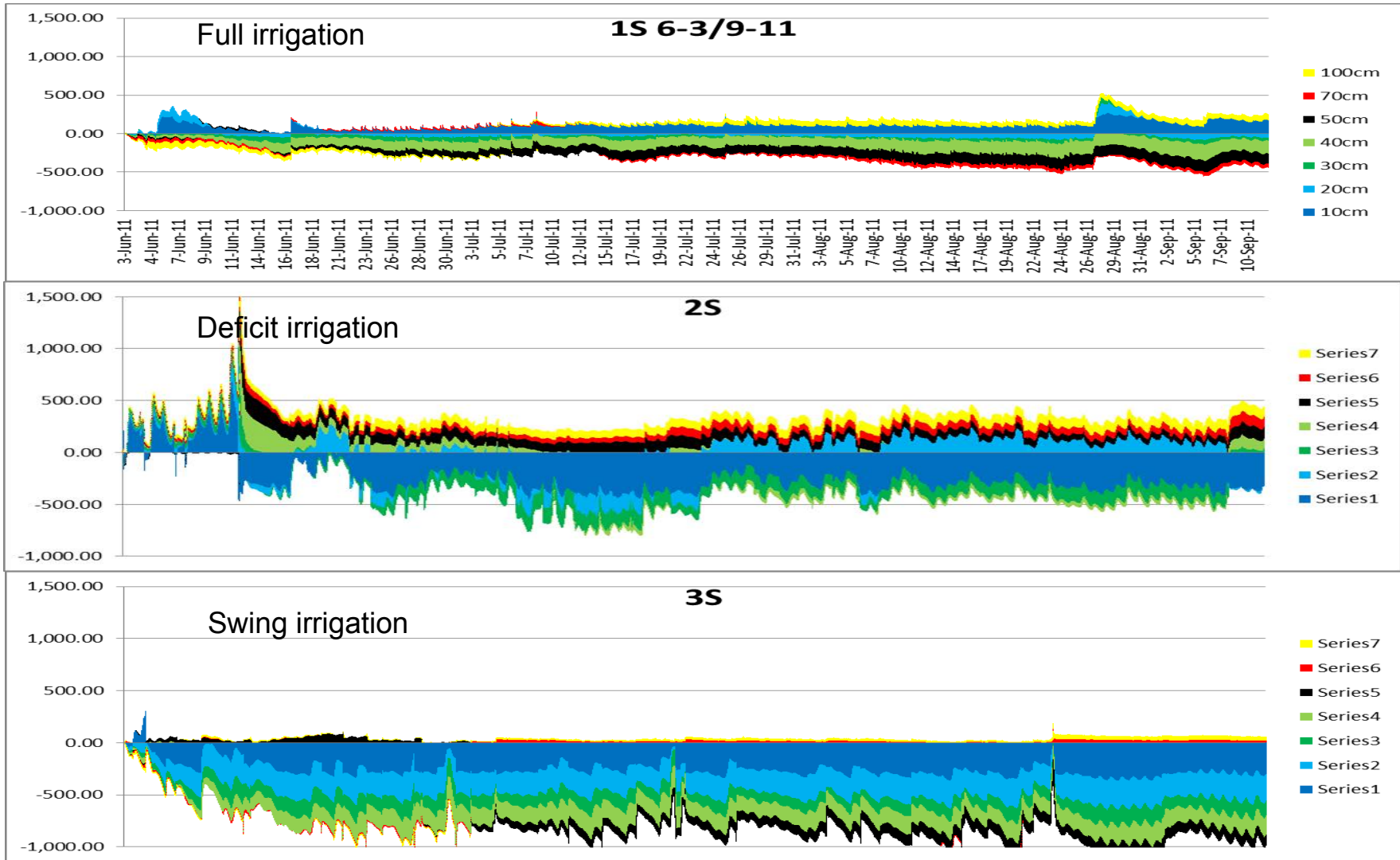
How to Read Visually Enhanced Salt Ion Graphs

Salt readings in Siemens/cm



The center line is the base line derived from the average of the 15 previous readings to the start date of the graph

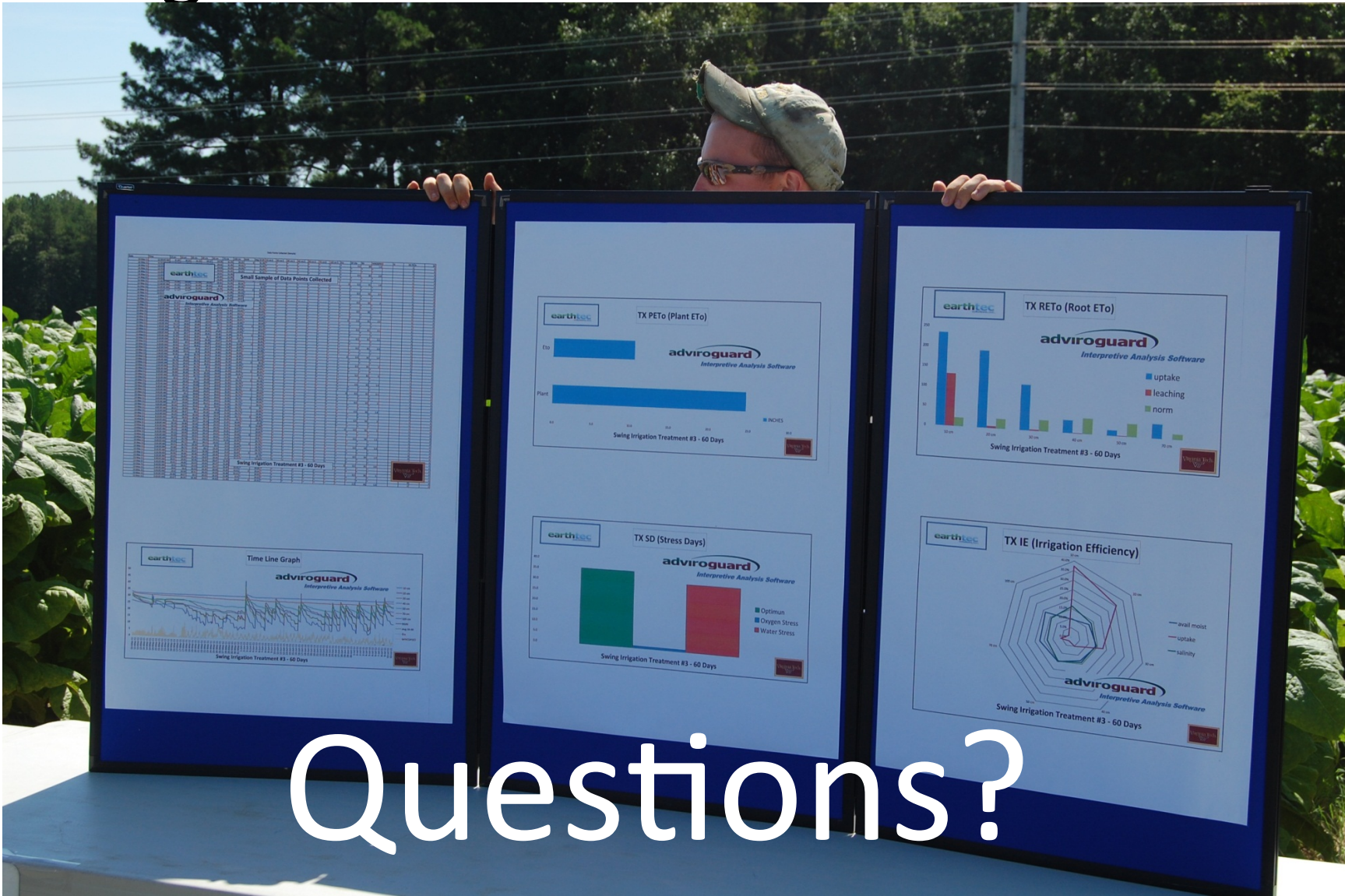
Net Change of Salt after 3 June 2011



Key Findings

- Tobacco roots are most active at 4 – 16 inches, regardless of the irrigation program
- There is a difference in leaf chemistry (%TA) when water applications can be controlled
- Irrigation affected salt movement; the driest soil profile produced the most salt movement
- There was no significant difference in final yields, regardless of irrigation treatment
- More nutrients appeared to be applied than were consumed by the crop
- Measured water uptake was greater than calculated ETo
- More studies need to be conducted on deficit irrigation as well nutrient movement into the crop and in the soil profile

Virginia Tech & Earthtec Solutions



Questions?

2011

