Zone Management Strategies for Sodic/Saline Soils

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Introduction

Irrigation water in southwestern Oklahoma can have salinity issues and some fields have developed salinity related low production areas. These areas can have thinner stands and lower yields than those that are less or not affected by this problem. This project was initiated to evaluate potential management strategies for these areas.

Figure 1. Typical poor crop stand in sodic/saline areas.

Methods

- A field that was known to have sodic/saline problems, and multiple years of spatial yield data was selected. Soil EC was collected using a Veris 3100.
- The selected field had a yield history from 2004, however sub-surface drip irrigation had been installed in the field between the 2007 and 2008 growing seasons thus yield data for 2008-2010 was used.
- Yield data were normalized across the three years.
- Normalized yield data were used to develop a yield stability map presented in Figure 2 below.

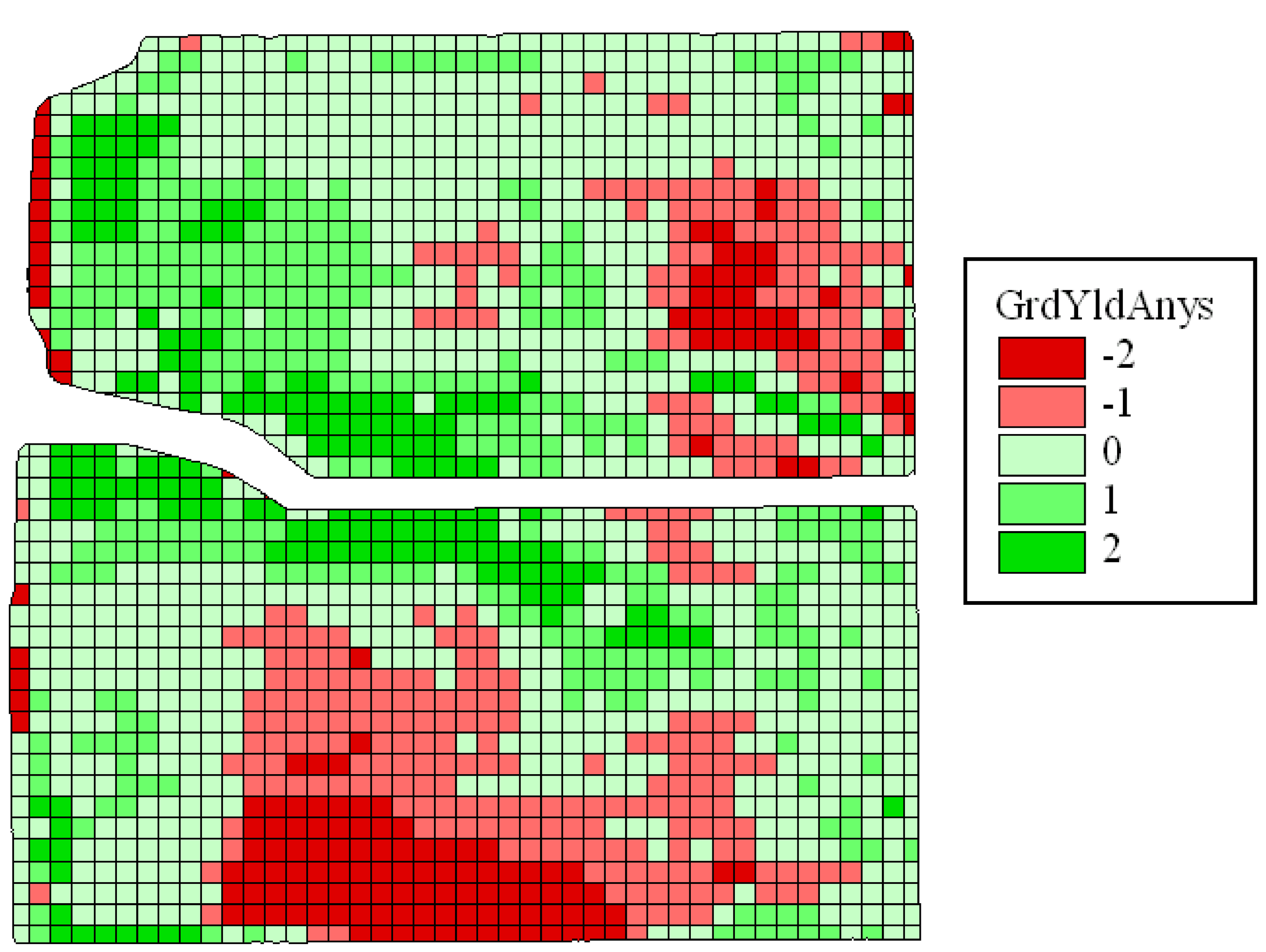

Figure 2. Yield stability map.

Methods Continued

- The yield stability map represents 5 yield classes and was used to delineate zones for composite soil samples:
- **2-Stable Very High:** This classification represents yield that has been consistently greater than or equal to 20% higher than the normalized yield.
- **1-Stable High:** This classification represents yield that is between 10-20% higher than the normalized yield.
- **0-Average (Unstable):** This classification represents yield that has averaged to 0 which means the overall trend has been high and low at different points.
- **-1-Stable Low:** This classification represents yield that is between 10-20% lower than the normalized yield.
- **-2 Stable Very Low:** This classification represents yield that has been consistently greater than or equal to 20% lower than the normalized yield.
- The samples were collected using a 24-inch soil probe and were divided into four subsamples: 0-6 inch, 6-12 inch, 12-18 inch, and 18-24 inch.

Figure 3. Soil sampling method: On the left is a tractor with a hydraulic soil probe and on the right is a tray where soil cores were divided into respective sub-samples.

- A combination of soil test results and a yield stability map was used to develop a variable rate gypsum application map with test strips and plots incorporated (Figure 4).

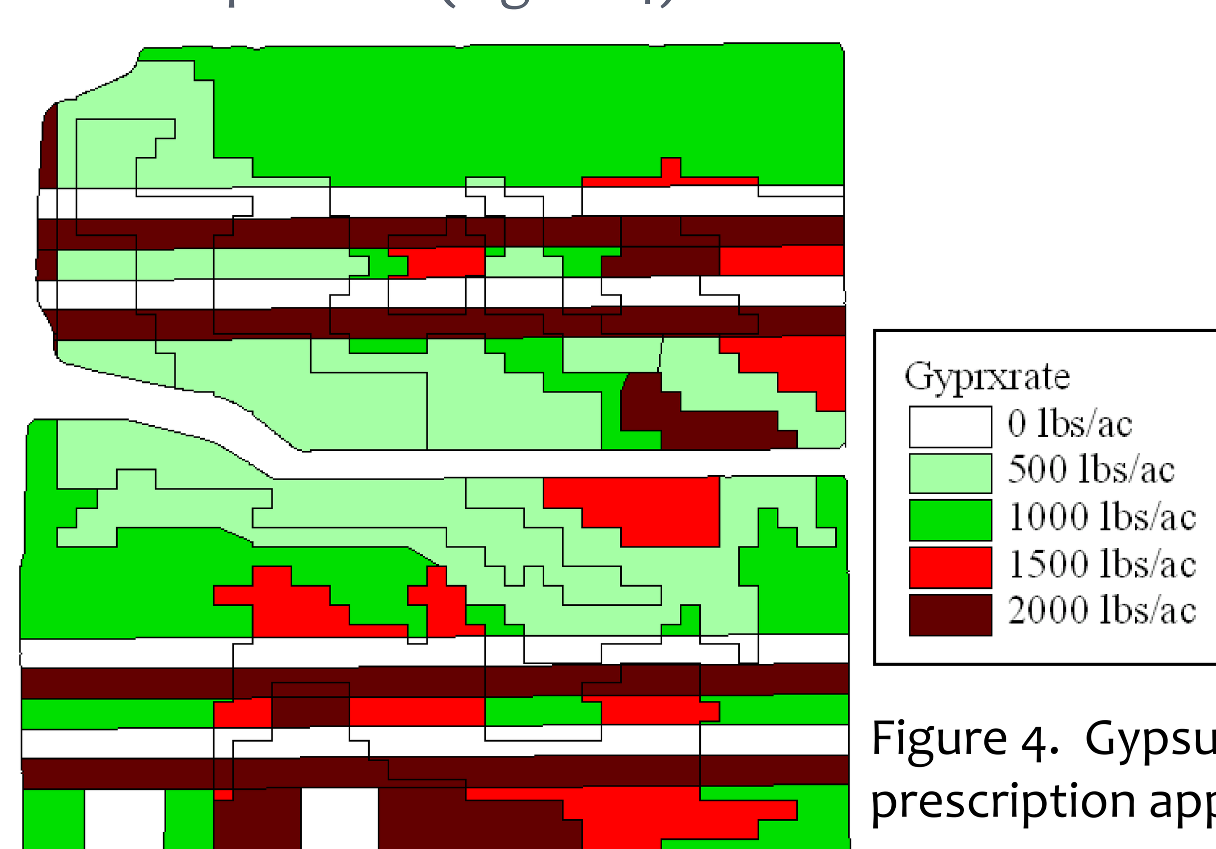

Figure 4. Gypsum prescription application map.

Methods Continued

- Gypsum was applied using a commercial variable rate spreader with a Raven Viper Pro Controller (Figure 5).

Figure 5. Variable-rate gypsum applicator.

- Extreme drought and storm damage resulted in poor stands and yield potential. Thus, yield results are not available for 2011.

Conclusions and Future Work

- Correlations were found between soil test results and the developed yield stability zones for such parameters such as soil test electrical conductivity.
- The correlations between soil test results and historic yield stability indicate that historic yield data can be used delineate management zones for sodic/saline soils.
- Future work will include yield and soil test data to determine if gypsum application is viable to manage sodic/saline problems in cotton fields in southwestern Oklahoma.
- If it is determined that gypsum is not a viable solution, other methods will be researched to potentially manage this production challenge.

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