

**AGRO / MSYM / AGEN 431**  
**Site-Specific Crop Management**  
*Fall 2008*

**Assignment 7 (20 pts)**  
 Due: November 25, 2008

**Precision Agriculture Profitability**

I. Corn yield response to potassium is assumed to be:

$$Y = 34.206194 + 0.4026841 \cdot K - 0.0002641 \cdot K^2$$

- Y – yield in bu/acre
  - K – potassium soil test after application in lbs/acre
  - 4 lbs/acre of K<sub>2</sub>O are needed to raise the K soil test by one lb/acre
  - Corn price is \$4.00/bu
  - Cost of K<sub>2</sub>O is \$0.10/lb
  - Initial K test was 160 lbs/acre
  - Use a K removal rate R<sub>K</sub> = 1.5 lb/bu
1. Plot the yield response curve (Yield versus K)<sup>1</sup>.
  2. Find the optimum K<sub>2</sub>O application rate.
  3. Show the resulting yield on the plot. What percent of the yield potential do we get?
  4. What soil K level should be expected at the end of the year?

II. Use the information given above. Assume that 25% of the field had K = 100 lbs/acre, 50% had K = 200 lbs/acre and 25% had K=300 lbs/acre. Use the same rule (Problem I) to prescribe the K<sub>2</sub>O application rate for both Variable Rate Application (VRA) and Uniform Application (UA). The following table shows the distribution of the estimation error:

Estimation Error	VRA percent area	UA percent area
-200 lbs/acre	5 %	18 %
-100 lbs/acre	15 %	21 %
0 lbs/acre	60 %	22 %
+ 100 lbs/acre	15 %	21 %
+ 200 lbs/acre	5 %	18 %

- Cost of field sampling is \$0.10/acre
  - Cost of grid sampling and analysis is \$1.50/acre
  - Cost of variable rate application is \$2.00/acre
1. Is VRA of K<sub>2</sub>O more profitable than UA?
  2. Did the total amount of applied K<sub>2</sub>O increase or decrease?

III. Develop profitability map in response to nitrate fertilizer using the following equation<sup>2</sup>:

$$\text{Profit} = \$4.00/\text{bu} * \text{Yield} - \$0.80/\text{lb} * \text{Nrate}$$

Compare profit distributions after pursuing variable and uniform application rates. Plot both maps.

<sup>1</sup> Use file *Assignment\_7.xls*

<sup>2</sup> Use file *Project\_5-4.map*