Grid Soil Sampling
Variable Rate Technology

Steve Wagner
Variable Rate Application of Fertilizer and Lime

• Predates current technology
  – Varied by field,
  – Varied by soil type
Fields are variable in soil type, soil properties and yield potential.

• What causes variability with in a field?
• What are some soil properties?
Crop Yield vs Soil Fertility

Green Text = Soil K Level (lbs/A)
Yield not Limited by fertilizer
VR Map for Management Zone

K Rec's for Corn
Based on Soil Test & Yield History
Benefits of Variable Rate Application?

• Matching the Recommendation to the appropriate part of the field.
• Efficient use of Resources
• “Increase yield by fixing low pH areas and save $$ by applying potash and phosphorus only to the areas of the field that need it”
Variable Rate Application

- Utilized with point sampling (Grid)
- Utilized with applications based on USDA soil maps or other types of management zones
- Utilized by applications based on crop removal calculated from yield monitor data
Grid vs Soil Type Sampling

• Grid –
  Take more samples
  Patter tends to be curved at 330 ft
  Sample from a small area

• Soil Type (Management Zones)
  Can have more complex patterns
  Less time and fewer samples
  Assumes field variability is accurately mapped - risk of mixing soil with diverse properties
Soil Sampling Sins

- Area sampling (USDA soil types)- Mixing soil with diverse properties – results in a average that is not appropriate for the extremes that made the average
- Not having the label (ID) on the soil sample bag match the ID on the map (matching is assumed, but required constant attention)
Soil Sampling References

- Soil sampling for Variable Rate Fertilizer and Lime Application – North Central Multistate Report 348 (U of Minn)
- Grid Sampling – isafarmnet (2012)
- MSU Bulletin 489 & 498S
GPS provides the following benefits to variable rate applications and sampling (information gathering)

- simplifies
- increases accuracy
- increases repeatability
- increases certainty
- automates
- allows for increased complexity
Equipment for GPS Sampling
Computer Generated Points

- A grid of equally spaced lines is established.
- 8 soil cores randomly collected within a 10 ft. radius of the grid center.
- Cores composited as one soil sample.
Choosing a Sample Point

- Choosing a point on best information available
- find variability,
- represent significant areas in field
- Use
  - Yield monitor data, aerial imagery
  - Your eyes – Topography, soil texture & color, weeds, crop growth
  - USDA soils map
  - Grower comments
Generating Variable Rate Maps

1. Make Recommendations from Lab results
2. Combine Recommendations with GPS info
3. Interpolation – inverse distance
4. Visual maps – pfd or paper
5. Prescription file for application
   – Each software has different file format
   – shape file – the universal transfer format
   – Shape file is really 3 companion files
Interpolation

none

– inverse distance

Grid Map of Soil Sampling Data

Contour Map of the Same Data
Same Data - Different Interpolation

Farm Works

SMS

Soil Sampling 2010 - Field 008
Files to the Applicator

• Typically email to applicator with pdf map, with shape files
• Import into applicator software ??
• Then use USB drive to transfer file into application computer.
• Sending file to application computer with wireless (cell phone ) connection is getting more common
Cooperation Between Sampler, Recommendation Maker, Map Maker and Applicator
Computer-Controler-Display
VR Equipment
VR Equipment for Spreading Dry Fertilizer & Lime

- truck with fertilizer box with belt at bottom to unload fertilizer
- computer with touch screen to control belt speed (pic)
- GPS antenna
- drive (usually hydraulic motor) to very belt that conveys fertilizer or lime to distribution system
- sensor to monitor speed of belt
- speed sensor (can use GPS signal to determine speed)
As-applied Maps

Figure 4. **As-applied** surface superimposed on the prescription map for field 8 with the FAF included for applicator A.
As-applied Map