Precision Ag Technology
…it’s all about the data

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Presentation Outline

- GPS and Network Technologies
  - Cellular
  - GPS + GLONASS
  - Satellite RTK
- Data Collection and Analysis
- Data Filtering and Processing
- Automated Data Processing
- Telematics/Analytics
GPS and Network Technologies

- Continuously Operating Reference Stations
- CORS Network RTK Correction
- Network subscription?
- Modem required
- Cellular data plan needed

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GPS and Network Technologies

- MDOT CORS Network
GPS and Network Technologies

- NDOR CORS Network
GPS and Network Technologies

- Raven Slingshot Network
  - Cellular RTK Delivery
  - Multiple Networks:
    - MDOT
    - MyWayRTK
  - Data Transfer:
    - Field to Office
    - Office to Field
  - Cloud Data Storage
  - Mobile Access
GPS + GLONASS Receivers

- The United States network: GPS
- The Russian network: GLONASS
- Each has about 30 satellites in orbit
- Other networks? (China, EU)

- The benefits may include:
  - Improvements in accuracy
  - Faster initialization times
GPS Network

- United States
GLONASS Network

- Russia
Satellite-based RTK correction

- Trimble CenterPoint RTX
- Horizontal accuracy of ± 1.5 inches
- Susceptible to typical GPS errors
- Standard initialization (up to 30 minutes)
  - Satellite or cellular network delivery
- One-minute initialization
  - Satellite network delivery
Satellite-based RTK correction

- RTX One-minute initialization (in blue)
Data Collection and Analysis

- Farm Management Software (FMS)
- Many FMS packages are available:
  - Apex
  - SMS
  - Farmworks
  - SST
  - SGIS
  - MapShots
Data Collection and Analysis

- Today FMS is more user friendly
- Handle data from multiple manufacturers
- Store and analyze field data
- FMS can perform many functions:
  - Comparison analysis (soil type, topography)
  - Prescription (Rx) map development
  - Batch data processing
  - Yield data normalization
Data Collection and Analysis

- Comparing Yield to Soil Type
- Soybean harvest data:
Data Collection and Analysis

- Comparing Yield to Soil Type
- Soil survey data:
Data Collection and Analysis

- Comparing Analysis Results:

![Graph comparing analysis results for different soil types](image-url)
Yield Data Normalization

- Corn (right)
- Soybean (below)
Yield Data Normalization

- Multi-year analysis using different crops:
Yield Data Normalization

- Provides a yield range in % (not bu/ac)
- Allows for comparison with different crops
- Still need to consider the “year” (wet or dry)
- Baseline yield data (3-5 years) is a good starting point
- May be useful for:
  - Identifying management zones
  - Locating test plots
  - Evaluating management changes
- Next step…yield “stability” maps
Automated Data Processing

- Automated processing is our goal (saves time)
  - Data analysis or Rx map development
  - Accurate data is critical
  - Good data in = Good data out
  - Bad data in = ______________

- Processing yield data is a good idea:
  - Improves total harvested grain estimates? No
  - Improves accuracy of information gained? Yes

- Yield Editor software, USDA (free download)
Data Filtering and Processing

- Raw yield data contains errors:
Data Filtering and Processing

- Yield Editor Software (USDA):
Data Filtering and Processing

- Processing (Yield Editor) can remove errors:
Data Filtering and Processing

- Interpolating with raw points to create a grid:
Data Filtering and Processing

- Interpolating with the filtered data:
Raw versus Cleaned Grid Data
Contour (zone) maps?
Telematics and Analytics

- **Telemetry:**
  - Data transmission from source to central
  - Storage, processing and analysis at central
  - Transmission back to source, remote control
  - Mobile-central or source-to-source transmission

- **Analytics:**
  - Finding or detecting patterns in data
  - Computer programming and statistical analysis
  - Data visualization and communication
  - Provides information for decision-making
Telematics and Analytics

- Telemetry has numerous Ag applications:
  - Weather data
  - Soil moisture status
  - Grain bin monitoring
  - Machine performance
  - Irrigation systems
Telematics and Analytics

- Analytics follow the data:
  - Industrial/Marketing
  - Healthcare
  - Social Media
- Ag systems are starting to generate large datasets
  - May range from 0.25 to 2.5 MB/operation/acre
  - What data do we really want/need?
- BIGDATA
  - New U.S. R&D Initiative
  - How to manage/utilize HUGE datasets

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Thank You!

- Questions/Comments?
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