**Background:** In an ever increasing digital and technological world, Agriculture is using data collected during field operations. This kind of information is used to make better management and input decisions.

**Statement of Problem:** Explore the potential quantitative relationships among machine data in agriculture in order to make better decisions in real agriculture practices.

**Alternative Solutions:**
- Altitude vs Lidar
- Track Field Topography
- 3D visualization for easy contour viewing
- Tracking Machine Performance
- See effects of daily maintenance
- Determine when to shut off grain cart tractor

**Method:**
- Data Collecting
- Device: ISOBlue 2.0
- Place: New Palestine, IN
- Data Analysis
  - Corresponding PGNs of variables
  - Percent Load - 61443, 3
  - Fuel Consumption rate - 65266, 1-2
  - Altitude
  - Conversion from Machine Data to numerical data in MATLAB
  - Acquired relationship among all variable with yield

**Analysis:**
- Looking at the different yield areas
  - A, B, & C
- Comparing to:
  - Fuel Consumption
  - % Engine Load
  - Topography
  - Soil Type
- Finding any correlation that would allow the farmer to make better decisions on the farm.
- Determining if it is worth the extra fuel cost to improve yield
- Etc.

**Economic Analysis:**

<table>
<thead>
<tr>
<th>Material</th>
<th>Purpose</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATLAB</td>
<td>Data Analyzing Software</td>
<td>$49</td>
</tr>
<tr>
<td>Flash Drive (64G)</td>
<td>Storage</td>
<td>$50</td>
</tr>
<tr>
<td>Long-term Stay</td>
<td>Travel expenses</td>
<td>$550</td>
</tr>
</tbody>
</table>

*The ISO Blue2.0 device costs less than 1,000 dollars if not sponsored.*

Digital agriculture has taken off in recent years as commodity prices are low and input prices are high. Collecting data like machine operations, and yield data allows farmers to see problem areas in their fields and help to know where to focus the operations efforts. This side of agriculture is something that companies and farmers alike are going to be using in the future.

**Conclusion:**
- There are a lot of different variables that go into making management decisions in a farming operation
  - Seeding Rate
  - Soil
  - Topography
  - Etc.
- This is just one small part in a larger picture that growers are looking at to better control inputs and maximize profits
- Takes serval years’ worth of data like this to get a better picture of each field

**Analysis:**
- Area A vs. Area B
  - Yield
  - Fuel Consumption
  - 7.2 L/hr increase
  - 9% increase
- Area B vs Area C
  - Yield
  - Fuel Consumption
  - 48 bushels/acre increase
- Altitude
  - 4 ft decrease
  - Area C vs Area B
  - Yield
- Engine Load in %
  - Percent Load
  - There didn’t seem to be much of a correlation with yield and soil type.
  - This year started off wet
  - Ended dry. Didn’t get rain when we needed it

**Soil Type Chart**

- C/A: Crosby silt loam, 0 to 2% slopes
- B: Brookston silt loam, 0 to 2% slopes
- Sh: Shoals silt loam, 0 to 2% slopes, frequently flooded, very brief duration
- MmB2: Miami silt loam, 2 to 6% slopes, eroded

**Soil Type Map**

<table>
<thead>
<tr>
<th>Soil Code</th>
<th>Description</th>
<th>Percent of Field</th>
</tr>
</thead>
<tbody>
<tr>
<td>C/A</td>
<td>Crosby silt loam, 0 to 2% slopes</td>
<td>60.9%</td>
</tr>
<tr>
<td>B</td>
<td>Brookston silt loam, 0 to 2% slopes</td>
<td>33.6%</td>
</tr>
<tr>
<td>Sh</td>
<td>Shoals silt loam, 0 to 2% slopes, frequently flooded, very brief duration</td>
<td>2.4%</td>
</tr>
<tr>
<td>MmB2</td>
<td>Miami silt loam, 2 to 6% slopes, eroded</td>
<td>1.2%</td>
</tr>
</tbody>
</table>