**Problem Statement:**

We needed to create a mechanism that can pick up dropped kernels of corn and soybeans off the ground behind a combine in a 24”x52” section. This section is equivalent to 1/5000 of an acre. The current method causes the combine to have to stop. We are trying to eliminate that issue.

**Constraints:**

- Sponsor - Mr. John Peters from John Deere
- Instructor - Dr. John Evans
- Tech Mentor - Dr. Kingsley Ambrose
- Past John Deere research programs dealing with kernel retrieval
- Current method is requiring the combine operator to stop machine
- Current method being tested

**OSHA Standards:**

- 1910.212 - Machine Guarding
- 1926.95 - General PPE Use of Powered Equipment
- 1910.243 - General Safe Use of Powered Equipment

**Design Matrix:**

<table>
<thead>
<tr>
<th>Model</th>
<th>Criteria</th>
<th>Cost</th>
<th>Reliability</th>
<th>Performance</th>
<th>Usability</th>
</tr>
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<tbody>
<tr>
<td>7.4</td>
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<td>0.3</td>
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<td>6.4</td>
<td>Sweep Design</td>
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<td>4</td>
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<td>Screen Design</td>
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<td>3</td>
<td>1.2</td>
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<td>Suction Design</td>
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<td>6.2</td>
<td>1.8</td>
<td>1.6</td>
<td>1.8</td>
</tr>
</tbody>
</table>

**Criteria:**

- Price
- Speed
- Weight
- Ease of Operation
- Overall Size
- Ability to attach to power broom

**Value Proposition:**

- Does not require combine to stop
- Can collect a sample in under 3 minutes
- Can be built for under $500
- Allows an operator to adjust settings based on grain loss found

**Initial Testing:**

- Initial testing conducted in Redkey, IN on February 22nd 2020.
- Corn and Soybean residue were both tested
- Total residue for each crop was roughly ¾ of a 5 gallon bucket (.5 ft/cu)
- Set up and collection process 2-3 minutes

**Future Testing Plans:**

- Use the collection device once it is completely fabricated
- Contents of the bag will be emptied onto a tray and weighed for a determination of success

**Final Product:**

- Stihl Power Broom modified for collection box
- Able to collect sample in 2-3 minutes including measurement of area.
- Final Product could be produced with lighter weight material and have better fitting collection box
- Relatively cheap simple design.

**Global Impact:**

- Reduction of labor frees up skilled labor to be used elsewhere.
- More efficient use of harvesting machines due to quicker sample collection and diagnosis of loss.
- Less fuel used to harvest more grain due to reduced harvest loss.
- Feed more people with better yields

**Costs:**

- Power Broom: $300-$500
- Collection Unit: $75-$125
- Competitive Products: $2500-$3000