## Problem Statement and Background

The agBOT Challenge is an international competition to create autonomous robots capable of performing agricultural tasks. The competition is hosted by Purdue Agriculture and Gerrish Farms. This year’s team will be competing in the Weed and Feed Competition and will need to design a vehicle capable of completing the following tasks (constraints) autonomously:

- Maneuver two or four 150-ft rows at a time and turn at each end. The bot must make two passes.
- Observe crop plants to assess health of the corn plant.
- Deliver fertilizer to distressed corn plants.
- Identify three common weeds within and between rows: ragweed, cocklebur, and foxtail.
- Provide real-time observations and feedback to the base station.

### Criteria
- Weight
- Level of autonomous operation
- Accuracy of weed or crop identification and treatment
- Decreased turning radius from existing design
- Versatility / Expandability

### Impact and Sustainability
- Revolutionize the world of farming by providing proof of concept of autonomous vehicles
- Compensate for shortage of qualified farm laborers
- Increase field operation efficiency and put money back into the pockets of farmers
- Reduce excessive application of herbicides and fertilizers by up to 70%
- Allow farmers to allocate their time and laborers to more important tasks

### Team and Task Breakdown

Building off of last year’s BOT, we realized there was still quite a lot of work to complete. We decided to divide tasks into three different subgroups to ensure completion of the BOT for the competition. These subgroups include:
- Weed and Feed System
- Electrical Control System
- Vehicle Control System

## Alternative Solutions

### Weed and Feed System

- Replace existing castor wheels with: Single, large, rear wheel
- Multiple rear wheels
- Design a trailer to house the weed and feed implements

### Engineering Tools

- PTC Creo – CAD modeling software used to design, visualize, and analyze trailer before fabrication

### Final Design

- Solid axle trailer designed for loads up to 2500 lbs.
- Modular design to restore functionality of vehicle when desired.
- Reduction of turning radius by 20%
- Stand alone 3-Point hitch increases versatility of platform

## Economic Analysis

<table>
<thead>
<tr>
<th>Weed and Feed System</th>
<th>Electronical Control System</th>
<th>Vehicle Control System</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>$ 6,634.88</strong></td>
<td><strong>$ 2,310.81</strong></td>
<td><strong>$ 13,640.00</strong></td>
</tr>
</tbody>
</table>

**Auxiliary motor ($2,379.95) donated by Purdue ¼ Scale Team**

**Linear actuators ($3,000.00) donated by Linak**

**Navigation system ($13,500.00) donated by Trimble**

**Linear actuator ($140.00) donated by Linak**

**Grand Total**: **$ 22,585.69**

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Sponsors:
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- John Deere
- Trimble
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- Mr. Richard Fox

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