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### Title: JD 2 Ground Sample Cleaning

#### 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.

#### Background Research:

- 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
- Stihl Power Broom field tests

#### Design Matrix:

Scores	Criteria	Cost	Reliability	Performance	Usability
7.4	Scoop Design	10	3	6	4
8.6	Sweep Design	8	10	8	8
6.4	Suction Design	6	6	8	6
		1.2	1.8	1.6	1.8

#### Criteria:

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

#### Constraints:

- COVERS A 24"x52" AREA (1/5000 ACRE)
- CANNOT EXCEED 50 LBS
- ABILITY TO RETRIEVE ALL KERNELS OFF THE GROUND IN SAMPLE AREA
- PROJECT COMPLETED BY APRIL 10TH
- MUST COLLECT COMPLETE SAMPLE WITHIN 5 MINUTES

#### OSHA Standards:

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

#### 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



#### 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

#### 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.



#### Future Testing Plans:

- TEST ON UNDISTURBED CORN AND SOYBEAN FIELDS
- USE THE COLLECTION DEVICE ONCE IT IS COMPLETELY FABRICATED.
- CONTENTS OF THE BAG WILL BE EMPTIED ONTO A TARP AND KERNELS WILL BE SORTED OUT TO DETERMINE SUCCESS.

#### Costs:

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



Sponsors:  
John Deere  
John Peters

Technical Advisor:  
Dr. Kingsley Ambrose

Instructor:  
Dr. John Evans