PURDUE UNIVERSITY

CAPSTONE/DESIGN EXPERIENCE 2016

Seed Lock Wheel

Agricultural & Biological ENGINEERING

Justin G. Lewton (Agricultural Systems Management)

Background & Objective:

- The objective of this project was to create a proof of concept design, to add a Seed Lock wheel, also known as a firming wheel, to a Case IH, 500 series air seeder row unit. The reason for this is that in arid areas seed to soil contact is critical for a crop to have the best chance at a healthy start. The seed is able to pull more moisture out of the surrounding soil, creating more even germination. This influences the crop throughout its life span until harvest, where a greater yield can be attained, due to the crop receiving a better start. This project is geared toward creating an after-market option that is easily attachable and will both provide the farmer with a better option than buying a new machine, as well as creating, and developing markets for Case IH.

Global Impact & Sustainability:

- With the ever growing population, it is critical for farmers around the world to be as efficient, and as productive as possible no matter the growing conditions. This design can help increase productivity of farmers attempting to grow crops in semi-arid conditions, thus helping feed the population.
  - Wheat is a prime example:

Impact of Greater Wheat Production on Global Food Supply*	
Loaves of bread / Bushel of Wheat	73
Loaves of bread Consumed per capita (U.S.) per year	53
2014 Harvested Acres	46,381,000
2014 Average Yield (bu/ac)	44
2014 Total Production (bu)	2,026,849,700
Increase in Production (%)	1%
Increase in Average Yield (bu/ac)	0.219
Increase in Total Production (bu/ac)	10,134,249
Increase in loaves of bread	739,800,141
Possible additional people fed per year	13,958,493

Budget:

Material	Aquisition	Cost/Value
Case IH 500 series Row Unit	Provided	$ 1,800.00
1/2" Flat Iron	On Hand	$ 18.28
3/4" Round Stock	On Hand	$ 7.50
3/4" I.D. Pipe	On Hand	$ 6.20
Seed Lock Wheel	Provided	$ -
1-1/4" Bearing	Purchased	$ 6.79
1/4" Linch Pin	Purchased	$ 1.25
1/2" Carriage Bolt	Purchased	$ 0.45
Paint	Purchased	$ 7.98
Machining/Fitting	156 Hours	$ 10.00
Total Value of Project		$ 3,408.45
Total Cost of Project w/ Labor		$ 1,608.45
Total Cost of Project w/o Labor		$ 48.45

Constraints:

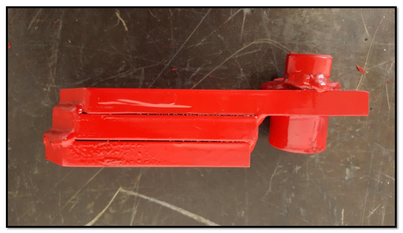
- Space inside of row unit
- No alterations to row unit
  - The goal of this project was to create an after market product that a farmer could buy and bolt onto his current machine, without hours of machine work, or alterations to Case IH's design.
- Simple bolt on part for farmer
- Adjustable down Pressure
- Quick release for wet conditions

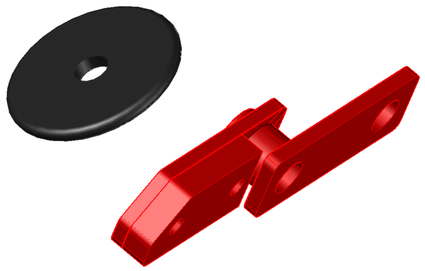
Timeline:

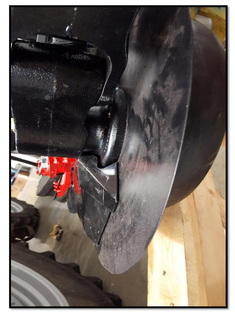
Spring 2016 Schedule	Seed Lock Wheel				
	Weeks 1-3	Weeks 4-6	Weeks 7-9	Weeks 10-12	Weeks 13-16
Order Materials					
Measurements/Design					
Fabrication					
Mock-up/Fabrication					
Troubleshooting					
Final Assembly/Report					

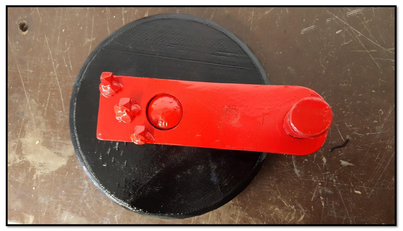
Final Solution:

- **Mounted Draw-Bar Arm**
  - Same mounting holes as the opener, for easy attachment.
  - Angle is corrected through an angled hole
  - Stops to keep the trailing arm from hitting opener when machine is lifted.
  - Pipe for the shaft pivot.
  - Contoured shape for tight fit, and to shed straw and other material.









- **Trailing Arm**
  - Hardened steel pivot shaft, with a hole for a linchpin for quick detachment.
  - Countersunk carriage bolt for smooth surface for spring to slide past.
  - 3 Different spring tension settings for variable down pressure
  - Custom Seed-Lock wheel of 7" in diameter, and only 0.5" wide to fit inside constraints, as well as fit inside furrow.

Sponsor:
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Technical Advisor:
Dharmendra Saraswat, Ph. D.

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*Data from USDA annual report

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