AGRICULTURE DRONE GRANULAR SPREADER

Aiming to bring high volume granular spreading to the American agriculture drone industry to for conventional fertilizer, insects, cover crop, and seeds.

TEAM SPONSOR: GUARDIAN AGRICULTURE

Figure 5: The team and sponsor supervisor Tom in front of Guardian Ag's MOE drone

Guardian was able to sponsor our project including our research trip to Salinas California to see one of their offices and Tulare California to do market research at The World Agriculture Expo

Figure 6: Team member Brian in front of the World Agriculture Expo Entrance

Knowledge gained at Ag expo:

- Dual disk design optimal for spreading
- Organic fertilizer not suitable for drones
- Scope of the ag industry
- Conventional fertilizer, Insects, Cover crop, and seeds are great aggregates for drone application

Figure 1: Guardian Ag's SC1 drone

Guardian is targeting the American agriculture market. Guardian's SC1 specifications include a 20-gallon tank capacity and a maximum take-off weight of 600 lbs, enabling it to cover more ground in a single flight to accommodate the average American farm size of 450 acres. The SC1 stands out from DJI, XAG, and other drones. These companies designed their ag drones for smaller fields in Asia, where farms average 2.5 acres, resulting in shorter flight times.

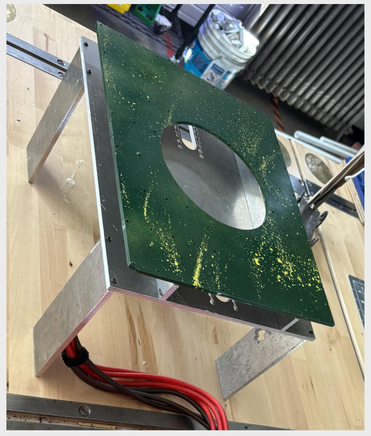

Figure 2: Action shot of our spreader being tested in the OSU botany field (NEED PICTURE STILL)

TESTING

Benchmark testing with an off the shelf manual hand crank spreader. Measuring swath width and density

	-24	-20	-16	-12	-8	-4	0	4	8	12	16	20	24
0	0	0	0	0.2	0.3	1.4	1	0.3	0.3	0.2	0.2	0.2	0
2							0.7						
4	0.05	0	0	0.3	0.1	0.5	0.3	0.3	0.3	0	0.2	0.2	0
6							0.5						
8	0.05	0.2	0.1	0.2	0.2	0.3	0.3	0.1	0.3	0.1	0.1	0.3	0
10							0.2						
12	0.1	0.2	0	0.3	0.3	0.4	0.6	0.3	0.2	0.3	0.2	0.2	0.2
14							0.3						
16	0.2	0.1	0.05	0.1	0.1	0.5	0.2	0.2	0.2	0.2	0.2	0.1	0.2
18							0.2						
20	0.05	0.05	0.1	0.05	0.4	0.2	0.1	0.1	0.1	0.2	0.1	0.1	0
22							0.1						
24	0	0.1	0.1	0.1	0.05	0.1	0.1	0.1	0.1	0	0.1	0.05	0

Figure 3: Test 1 with store bought spreader

2nd round of testing with our prototype has yet to be completed but we plan to put the information here when it is ready

	-24	-20	-16	-12	-8	-4	0	4	8	12	16	20	24
0	0	0	0	0.2	0.3	1.4	1	0.3	0.3	0.2	0.2	0.2	0
2							0.7						
4	0.05	0	0	0.3	0.1	0.5	0.3	0.3	0.3	0	0.2	0.2	0
6							0.5						
8	0.05	0.2	0.1	0.2	0.2	0.3	0.3	0.1	0.3	0.1	0.1	0.3	0
10							0.2						
12	0.1	0.2	0	0.3	0.3	0.4	0.6	0.3	0.2	0.3	0.2	0.2	0.2
14							0.3						
16	0.2	0.1	0.05	0.1	0.1	0.5	0.2	0.2	0.2	0.2	0.2	0.1	0.2
18							0.2						
20	0.05	0.05	0.1	0.05	0.4	0.2	0.1	0.1	0.1	0.2	0.1	0.1	0
22							0.1						
24	0	0.1	0.1	0.1	0.05	0.1	0.1	0.1	0.1	0	0.1	0.05	0

Figure 4: Test 1 using dual disk spreader

PROTOTYPE DESIGN

When making the prototype we had these criteria driving the design. The design of our spreader comes down to three systems

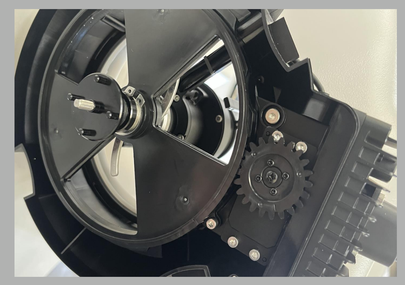

Figure 7: Our manual feed control system (NEED PICTURE STILL)

1- Feed Systems and Feed Control

- Passive feed systems use a hopper and spreader to regulate flow.
- DJI employs active feed controls like valves and gates; passive systems are simpler but harder to regulate.

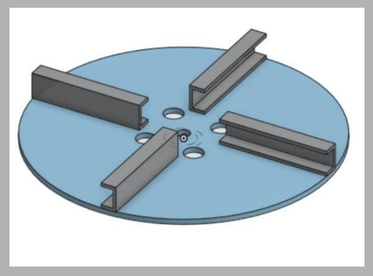

Figure 8: Centrifugal disk design

2- Distribution Systems

We opted for a dual centrifugal disc design that we saw being used on large rigs at the world agriculture expo.

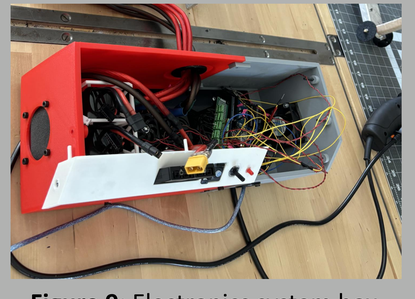

Figure 9: Electronics system box

3– Electronics

- Run by an Arduino Uno
- Battery powered for portability
- Regulates the speed of our dual rotating disks to properly spread the media.

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