

**PROGRESS REPORT**  
**North Central Region**  
**Sustainable Agriculture Research and Education (SARE) Program**

Progress Report Year: 2016

Project Title: A Model for Mitigating Giant Ragweed on Certified Organic Operations: Ag Engineering and Farm Tours

Project Number: FNC15-995

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### **WORK ACTIVITIES**

Michelle D. Gregg, food regulation compliance officer and life-long organic farmer, created an initial draft for an implement that would skim the top of soybean canopies, cutting and collecting giant ragweed material (stem, leaves, seed pods, pollen).

The goal is to collect the reproductive parts of giant ragweed that infiltrated Gregg Farms for over 15 years, and decimating yields to 15% of what they were prior to the introduction of giant ragweed. Plans were presented to mechanical engineer, Dwight Mitchell in spring of 2016, and he agreed to create formal plans and construct the device based on M. Gregg's initial sketches.

By April 2015, Dwight Mitchell, engineer from Athens, Ohio and retired vocational agriculture instructor, presented the above draft to M. Gregg, and father, Randy Gregg, who owns and operates Gregg Farms.

The construction plan pictured above has been modified slightly, but remained largely as planned. This creation is an experimental design as no other existing implement of similar function or construction exists in US Patents.

The efficacy of the device will be measured in two distinct ways:

**1) square-foot population density of adult giant ragweed** plants in mid-July of the year preceding device use, and the year after device use. Years of data collection will continue after one year, but for the sake of reporting in this 2-year funded grant, only 2 years of data will be reported.

**2) Comparative nutrient testing of soybean plants** throughout the course of the production season, in the year preceding device use and the year following device use. These nutrient tests will track the changes in the nutrient uptake capacity of the soybeans as a dependent variable on the giant ragweed per square foot calculation from #1, above. What we expect is that as the per-square foot count of giant ragweed decreases as a result of seed collection by the device, the nutrient uptake of the planted crop, soybeans, will increase because of less competition with the robust giant ragweed.

Video and photos are collected throughout the project and will appear in the final project report.

## **November 2014**

M. Gregg acquired D. Mitchell as engineer for the project, and showed him preliminary drawings of what was needed for removing the ragweed material above the canopy of the soybeans. His response below:

November I am following up with a summary of my preliminary design for "Rag Weed" control in your organic soybean fields. With your permission I would like to design the cutter/bagger weed machine so it covers 152 inch spacing (4 row). I would like to see the row between the 4 row planter runs to be spaced 48 to 54 inches so cutter/bagger can track between the 4 row planter spacing without running over the beans. Even though the cutter/bagger spans the 4 rows it will only top the two inside rows at a time and when machine turns it will top the two missed rows. The reason I am doing this is to keep cost and weight down. The machine will also have other uses it can be outfitted with in-the-row seats for hand and mechanical weed picking when beans are shorter. My present designs are using a blade cutter with air veins to pull weed heads into a vacuum air channel and through vacuum/blower that has a chopper knife. Weed tops would be collected into a bag. In theory the design has real possibilities if I can find a power source that is cost effective and reasonably light weight. The drive system must drive the cutter, blower/chopper, and ground drive. I am shopping around for components and as usual as I find components the design continues to change. I am using \$5,000.00 dollar machine cost as my goal so I have to probably use used as well as new parts. One last consideration I will have a seat for operator because he or she will have to guide cutter above soybeans and I am sure height will fluctuate. Also machine frame will have three narrow tractor type sprayer wheels and it arches over the rows, I call it the spider

## **March 2015:**

After the notice that our grant proposal was accepted, the hunt for parts begins. Mitchell (engineer) is a skilled craftsman and as a vocational ag teacher, always has budget in mind. He has a well-developed resource network for used mechanical parts and creates a parts list, and sets out to acquire parts for unit assembly.

## **3/20/16:**

The amount of money dedicated to this project will set the limits to the design strategy. I have been researching alternative designs in agriculture equipment and I have found some interesting approaches to farm power in organic vegetable production. I have a tig machine and I can make a light weight arch that can span four rows and support a cutter bar or flail mower. The drive system can be a small motor that can drive ground speed and cutters. Another option is pedal power for the ground drive and a electric large hedge cutter. I have located a number of systems using pedal drives in field cultivation. The conundrum is keeping weight, energy and cost within limits set by you and your father. I am not sure if pedal drive would be suitable for your father or that we need to use a small engine (8 to 12 hp.). Another option is to develop this as a tool bar that can also be used for cultivation until crop gets more developed then can be used to cut weed tops. My schedule is pretty busy but we should meet soon and discuss the options. My theory is still predicated on skipping every fifth row so the machine can travel through the soybeans at any time or for that matter through any row crop you plant. Best time for me is evenings. I can provide drawings when we determine the design limits.

## **April 2015:**

Mitchell visiting family in Europe. No production logs.  
Soybeans planted April 30-May 3.

## **4/28/15:**

Michelle and Randy Gregg, attached is a concept drawing for the mechanical weed control machine for your organic grown soybeans. My draft will need some explanations and please take

in account it is a rough draft that will probably change as time goes by. As you may suspect my tally has it already over budget (machine \$4,000 engineering and building \$2,000) and I am looking at components I can substitute that reduce the cost. One thing is that building such an elaborate machine just to support a cutting bar seems over the top but I have an option that can be added that makes it a mobile tool bar and can support five row cultivators. The cultivators can be serrated discs that lay on their side and grab weeds and pluck them, roots and all, from the soil where they dry out and don't re-root themselves. The 6 by 12 inch tube steel that supports the machine also acts as a passage way for the break cable and hydraulic line for the hydraulic lift cylinder for the cutting bar but can support an additional line for a drive motor if you want to use machine as a tool bar for cultivation. The machine will be support by the three wheels attached to the overhead tube steel. The operator can turn the front wheel in front of the drive wheel and apply the break to the swivel wheel for making turns. The operator will be able to raise and lower each side of the cutting bar independently and use a foot control to increase or decrease ground speed. I have found some sources of used components that could reduce cost however in our agreement we must provide a mechanism for paying for components when found. I am sure Michelle, you and Randy will have many questions. I have no idea how this is going to turn out because this is experimental but I usually in the end able to bring an idea to fruition.

### **May 2016**

Ragweed and soybean samples collected at Gregg Farms for nutrient testing and to show comparative size to soybean canopy. Ragweed samples register four foot tall. Rag weed in beans because of tillage will be shorter. Attached is a picture. I am going out and walk unsprayed bean fields today. What is the latest date that your dad can get his tractor through the beans without damaging them? Notice small root system.

Mitchell needs replacement surgery. Will keep us posted on timeline and how it will affect project.

### **5/28/15:**

On my way to Cottageville WV to pick up parts for our project I stopped and visited progressive farms that I had served in the past. Attached is a picture of sweet corn on May 27th that is already waist high and about two weeks away from producing market ears. The farmers in this area were always trying to get the earliest, sweetest, perfect ears. They used a spacing similar to what I suggested but planted doubled close corn rows and then covered double rows with clear plastic. This allowed them to plant early and when corn grew it pushed up plastic like a crop tunnel and when frost danger past they cut slits in the plastic so the corn could grow on through. The wide lane between every 8 or 12 double row was left for hand picking crop and moving equipment up and down the rows. My original thoughts were to attack organic weed control using inventive spacing and a machine that can straddle rows. I am just foot noting this for the final paper on the project and staying with the mission of a 38 inch row mechanical weed control machine.

### **June 2015**

Confirmed that most tillage stops in July, and the bean canopy risks being damaged if the implement were taken out later than June 30, 2015. At this point we went out with the hedge trimmers, as we do every year, and started cutting of the tops of the developing ragweed plants to deter them from going to seed. Once the ragweed goes to seed, the pods (whether cut or left standing) will fall to the ground and re-seed next year's ragweed crop.



The interesting part about the height: giant ragweed is really good at growing at the same rate or just slightly higher than the canopy of whatever is around it. Giant ragweed of the same age will only reach 4-6 ft in bean fields while it reaches 10-14 ft in corn fields, competing for light. It only grows as high as it needs to out-compete what is around it, nothing more.

### **6/20/15:**

Observations about giant ragweed at Gregg Farms: it is by far the only weed in the field. While other neighboring organic farms have an abundance of fox tail and lambs quarters, Gregg Farms has 95% giant ragweed, and only 5% other weeds. The first photo may be a Flea bane or horse weed but is another problematic annual. The first plant has fibrous roots and the giant has a tap root making it hard to pull. Cutting seems the best option.

Massive de-weeding event. Lots of rain. Because of the central taproots of the giant ragweed, it is easy to remove them and their root by the soil is wet. Pulling the giant ragweed out by the roots by using a large mechanical device is not recommended. Pulling weeds by hand allows for discriminate removal. Giant ragweed tends to intertwine with the plants around it so running a large device through the field that "grabs" the ragweed and pulls it out by the roots risks damaging the surrounding soybean crop too much.

While manual removal of the ragweed is easy after a hard rain, this is the worst time to have equipment in the fields, further supporting the need for a device that simply cuts the weed right above the soybean canopy. The dilemma is that the soybean canopy grows higher during the year, and we need to continually cut the giant ragweed. The solution is to create the device with hydraulics so it can elevate above the growing soybean canopy as it grows.

Following a rain not a good time to be in the field. Making a cutter bar that moves up and down above beans seems most logical. Mitchell decided that a flail cutter (cuts into small pieces) should replace our original plans for a cutter bar, because the giant ragweed material is very hardy, and the thick stems will clog up the weed containment chute if not chopped upon collection.

### **July 2015:**

We interviewed Dean Mc Ilvaine, an organic grain farmer in North East, Ohio. He developed and showcased at a recent farm tour, a weed puller for giant ragweed. He said he uses his puller in August in 30 inch rows. We asked about tire damage to beans -- he said he has collateral damage. Pulling late pulls up large clumps of soil or just damages stalks on weeds. I shared about our project and he gave me contact info for his weed puller. I did discover that a mature Giant Rag Weed canopy can cover as much as a square meter. He thinks cutting and collecting seed heads has promise.

### **7/10/15:**

The latest acquisition, a Ford Flail Mower from Belmont County, Ohio. Purchasing a battery for Kubota engine tomorrow and ordering repair parts which should use balance of first draw from the grant (\$1500).



\$170.00 for parts for the repurposed Kubota engine. We have the flail mower in the shop and are taking it apart and redesigning the bonnet (shield) and reducing the overall weight.

Pictured below, the original flail mower (blue cover)



**7/15/15:**

Soybeans are 6-8 inches high. With the additional time spent in locating needed parts, it looks like we will be entering the fields with the completed device in 2017, not 2016.

The soybean fields are really clean. See pictures. Usually an effect of late planting. Corn however, well, dad just mowed the corn last week because it was overrun with ragweed. The fields were too wet to get the cultivators in, and the giant ragweed suffocated the corn. 2 fields of corn, about 2/3 total planting, remain. They got cultivated before the month long flood that was June. 28 days of rain here.

**7/20/15:**

Update on organic bean weed cutter. Attached are some pictures of my progress. I have to re-engineer the drive components and tomorrow I am getting parts to rebuild flail mower. I will give you a more accurate description on Monday via email. I am pushing for completion August 31st



More pictures, Kubota 25 hp engine, rear hydraulic assist drive, hydrostatic transmission, hydraulic pump for lift system, and power steering

The machine in the pictures is suspended two feet in the air and I will hoist it another two feet for a total of four feet. The flail mower has been gutted and will fit tight to the machine



### **7/30/15:**

Here is what I am doing this week 1) assembling new parts for flail mower 2) building chain drive drop boxes on front axils 30 inches to raise machine base above beans 3) build extension to rear steering axil same as front axil 4) mount hydraulic motor to flail mower however may have to buy new motor. I will be sending receipts soon.

I have been measuring beans locally trying to come to a general average bean height so I have a benchmark for machine height. The fail mower will be able to raise 6 to 8 inches. I may be able to get a little more movement if we need more range of movement.

### **8/10/15:**

From Mitchell: I have missed our project date, but recovery from hip replacement surgery was brutal, and humbling.

Beans shot up and growing really well. Manually removing the ragweed that we can. Harvested the oats, which are about 50% giant ragweed seed intermixed. This is bad because giant ragweed seeds hold lots of moisture and will rot any grain it is next to in storage unless you have a dryer. If we had a seed cleaner, we could not only clean the oat seed before planting next year, but also go ahead and harvest the beans this year and sort out the giant ragweed seed.

The goal is to collect the reproductive parts of the giant ragweed and prevent the seed from hitting the ground in 2016. Since the giant ragweed seed is so hearty, it stays viable in the soil for years. With tillage, seeds resurface, receive sunlight, and start to grow. If we can find a seed cleaner, we can harvest the soybean crops on time now that we know the device will not be completed by July, and running it any later than this is too risky and damages the crops. The seed cleaner will allow us to harvest on time, and still retain the reproductive part of the giant ragweed, preventing it from reseeding in 2017 crop. This is not the solution, but will help allow us to do something that we haven't in the past- save our organic soybean seed for replanting. If it's clean, we can now plant soybeans and not giant ragweed with soybeans. Searching for seed cleaner.

### **7/30/15:**

Pictures of 12 foot + rag weed in adjacent corn field where sprayer missed.



### **August 2015:**

Below is a drawing of the revised machine with changes. Before I cut legs I want to make sure of height variations shown on left hand margin. I have a hydraulic cylinder controlling a height range from 24 inches to 50 inches, please confirm that is okay. If you notice that rear wheel is set at lowest cutter setting and as machine is raised the cutter tilts up giving the machine more range. I traded front tires for narrow higher tractor tires also to give hydraulic motors more clearance. I picked up the steel Thursday. Hydraulic motors have been tested and front hydraulic pump and control spools have been ordered. This week I am weeding up from and making hydraulic motor mounts. The rear section supporting Kubota engine and cooling system is complete however I may have a fuel issue with the diesel engine so I am holding



Back on some funds in case I have to rebuild or replace injectors or glow plugs. Here are the pictures.

We agreed that 24" - 52" is an ideal height for flail mower, as the canopy of beans now is at 50".

I will be welding frame this week and building mounts for hydraulic motors. Next I will be building wheel legs and wheel lift system hydraulics. The rear tail wheel will be adjustable.

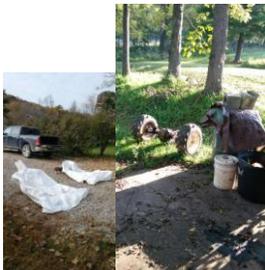
## **August 2015**

**8/2/15**

The hydraulic order did not ship this past week but I expect it next week. I will send update late next week. It is raining and cold here I had to take a short job from Ohio University to make some payments. I spend more time looking for parts than building the machine. I will never get my labor back but I really am enjoying the challenge. The hardest part is handling heavy parts by myself and moving them into place. Working on engine today. Keep in touch

**8/15/15**

Below is a picture of the bag that will be suspended under the SARE machine. If you look at the drawings there is a 12 inch X 6 foot space on the underside of the machine for the bag. On the back of the bag is a tie to dump bag contents and to allow air to pass through. I might have to add a gas leaf blower at the discharge point from the flail mower to keep material moving back into bag. The rear portion of the bag hangs in the row in front of the tail wheel.



Spare bag in case we should need it. Tote bags were donated by Shagbark Mill.

**8/19/2015:**

The hydrostatic transaxle (above) that I removed from the original tractor that I could try and sell or hold back as part of the grant inventory. I originally had planned to use it but it was too narrow to safely support the cutter. My original plan was for a more condensed tractor with a lighter cutting bar. However when we decided to capture the seed heads the cutter bar design had to be replaced with the flail mower so we could chop the tops and pack them in a bag. Actually I like the final design and the prototype will be quite useful and can be a model for a small organic farm tractor.

**9/10/15:**

Pictures of injectors and engine. I will have spent all but \$200.00 and if it is okay with you I will have to

spend some of my labor money to get project completed. I will send you receipts from Bobcat next week and projection of parts yet to purchase. As soon as it is finished, I can assemble frame with flail mower attached wheel assembly and hydraulic lift next



### **September 2015**

Mitchell out of state caring for family.

### **October 2015:**

I am sending updated expense report and I am to buy bearings, spline shaft. I am anxious to get wheels under it so I can move it around.



### **November 2015:**

I will have to buy hydraulic lines but I am not ready for them. I am attaching flail mower (above) to the front frame so I can determine wheel assembly dimensions. This will be tricky because I will have to elevate frame four foot in the air. Once I get the dimensions I can start assembling the flail cutter and wheel assembly. I have been trying to keep frame and flail mower light and stripped down so I can maneuver it for welding and fabrication



### **December 2015:**

I had to take frame apart (above pic) and add more support and as you can see from picture I am mounting wheel assembly. I am trying to get wheels on so I can start on hydraulics. Some other pictures,

the trail wheel, the mounts for the frame sections, and beefed up frame

### **12/20/15: Year's end recap:**

Collection of parts and assembly of initial designs to test efficacy, weight bearing capacity, maneuverability, and very important, safety. This is a new device being created, and plans needed to allow for Mitchell, who is volunteering most of his time on this project, to manage his job and other demands while contributing to the project. Weather gets cold in Ohio during the winter, so much of the construction progress through March 2016 will depend on weather conditions and availability/accessibility of parts (most junk yards are covered in snow in the winter here).

The bulk of purchasing occurred between these months. Parts like the engine and the mower ended up being replaced for safety reasons, torque needs, and for overall logistics of the process feed of giant ragweed through the system.

The hydraulic components from Jacobsen Tractor are anticipated in the next 14 days. The weather is getting cooler so the unit will need to be moved to the indoor shop area, and we will need to acquire a lift jack to support the implements during assembly. There is an issue with the engine, it has difficulty starting. The glow plugs needed to be replaced, but after replacing them, the engine still is not functioning properly at start. The engine is pretty central to the whole project, so it is best to replace it now then have to undo a lot of construction later to get to it to replace it. The hydraulic system is completely stripped. The frame components will remain detached until we install the new engine. Once new engine is installed, the hose lengths and fittings will be re-evaluated. The front and rear tail wheel assembly can be installed once the frame units have been attached and elevated to 24". Lastly, we will assemble the flail mower.

The budget is going to be tight, but let's aim for \$4600.00 in parts and do all we can to stay within that. The trailer is another variable- we do not have a trailer large enough to haul the device to the farm once complete (260 miles away). We are not going to make the August goal for field testing, but if the weather and other variables cooperate, we will have a frame and basics together by late Spring 2016 to field test.

### **October 2015-March 2016:**

Relatively harsh winter, transportation, parts, and progress limited. Mitchell also has a few scares while assembling and incurred injuries. A 1-Ton hoist was purchased to prevent future injuries, and recovery time needed. He also has a hip replacement surgery (double) on the horizon that cannot wait too much longer.

### **January 2016:**

About the tractor: I realized that I had no way to stop tractor when engine off so I am working out a break system on the swivel rear wheel. This will be a trick because wheel can turn 360 degrees thus it could knot up cable. The picture enclosed is the wheel am going to rework wheel assembly to support break send pictures of parking break when completed.



A few pictures of progress. You cannot see it but I have cutter bar in flail cover and working at hydraulic motor installation. I have to machine the adapters for the drive and mount for front hydraulic pump. The big trick will be building rear trail wheel and engineering break system.

Just so you know I am going to have hip replacement surgery on the 13th of June but doctor thinks I will

be able to continue work on project in a couple of weeks. Hope to have made significant progress before operation.



March 2016: Mitchell in Europe with family, no production.

**June 2016:**

**Mitchell double hip replacement surgery. Out this month**

**July 2016:**

Ragweed About waist high. Beans are about knee high.

I have been checking soybean fields and I know how anxious you are for the machine to be done. I am expecting parts for hydraulic motor that drives flail mower also carbon hard surfacing for lift system. I will keep you advised. Still working on transportation. I may need last \$500.00 dollars for hydraulic lines and rear brake. Hope to have it on wheels this week. Leg getting stronger but I still have limited mobility. Check in on Friday

**7/20/16**

I had to order lift cylinder -- the one I have has bad rod and leaks. I machined new spline shaft for flail mower hydraulic drive motor. Tomorrow I am working on rear tail wheel. I am going to town and buy bearings and bushings and I hope to be able to wheel the tractor out of shop this weekend. My gentry crane cannot get past wheels so when I roll tractor out of shop I can move crane to the front. I have a 2,000 lb. scale I use with crane to measure weight distribution and I use this data to place rear weight on machine. I am waiting to send picture when I roll machine outside. I still have to line up a trailer.

Soybeans are 35" tall. Too high to run implement through to collect ragweed this season without damaging soybeans.

**August 2016:**

Here are some pictures. I am working on rear wheel and I am making the assembly so it can change angles as the machine moves up and down.

**8/10/16**

I have both hydraulic pumps on and finishing making bearing assembly for hydraulic motor for flail mower. I am making wheel stops for full extension. I found that raising machine to full height changes trail wheel angle so I have changed rear wheel design to account for different height setting. I ordered special annular bits to make holes for wheel turning post. My big hangup is that I have to crawl around machine and make fabrications. I never realized that my recovery for my hip limits balancing from leg to leg so I am still limited as to what I can do. I trip a lot so I have to be careful but I am slowly getting better. I know the season is fleeting, my operation came at the wrong time I apologize.

I have had to rearrange all valves and things such as two oil filters, battery, seat, controls and roll bar. As soon as all hydraulic components are placed I can order fittings and hoses. I have one last problem to solve is the direction the flail mower turns. I will have to look at a flail mower that is attached on a boom like that the highway uses. When mower is elevated above ground the mower has to drag weeds into the housing and I need to determine what direction throws cutting

Straight back before I install cutter knives and determine motor rotation. After the above I will be ready for

test drive and I am sure something will need to be re engineered. I will keep you advised.



**8/22/16**

Getting close to getting tractor done. Here is a picture of rear wheel assembly. Confirmed ragweed already entered pollen stage.

**8/3/16:**

I had to order lift cylinder the one I have has bad rod and leaks. I machined new spline shaft for flail mower hydraulic drive motor. Tomorrow I am working on rear tail wheel. I am going to town and buy bearings and bushings and I hope to be able to wheel the tractor out of shop this week end. My gentry crane cannot get past wheels so when I roll tractor out of shop I can move crane to the front. I have a 2,000 lb. Scale I use with crane to measure weight distribution and I use this data to place rear weight on machine. I am waiting to send picture when I roll machine outside. I still have to line up a trailer.



**8/18/16** photo:

Michelle here are some pictures. I am working on rear wheel and I am making the assembly so it can change angles as the machine moves up and down. The orange piece of steel on the ground is the 250 lb weight. I shortened the machine so tail wheel will ride just below the weight. I also included a picture of the hydraulic motor drive assembly. I am doing a little better on my leg but still cannot twist or bend on it. Last week I was crawling under the machine and got wedged in between some blocks and could not turn to get up, I thought I would have to call 911. My mobility is improving every day. Tomorrow I hope to get hydraulic cylinder for lifting machine. I will keep in touch

**8/24/16:**

I have both hydraulic pumps on and finishing making bearing assembly for hydraulic motor for flail mower. I am making wheel stops for full extension. I found that raising machine to full height changes trail wheel angle so I have changed rear wheel design to account for different height setting. I ordered special annular bits to make holes for wheel turning post. My big hang up is that I have to crawl around machine and make fabrications. I never realized that my recovery for my hip limits balancing from leg to leg so I am still limited as to what I can do. I trip a lot so I have to be careful but I am slowly getting better. I know the season is fleeting, my operation came at the wrong time I apologize. I have had to rearrange all valves and things such as two oil filters, battery, seat, controls and roll bar. As soon as all hydraulic components are placed I can order fittings and hoses. I have one last problem to solve is the direction the flail mower turns. I will have to look at a flail mower that is attached on a boom like that the highway uses. When mower is elevated above ground the mower has to drag weeds into the housing and I need to determine what direction throws cutting

Straight back before I install cutter knives and determine motor rotation. After the above I will be ready for test drive and I am sure something will need to be re engineered. I will keep you advised.

**September 2016:**

Rear wheels re-attached after body was modified to better support weight. Body was modified after mower was replaced. Mower was replaced to more thoroughly cut the thick and gnarly stalks of giant ragweed without compromising the seed. The point is to collect the seed while mowing off the giant ragweed that obstructs sunlight from the bean canopy.

Project on hold as engineer's mom got hit by hurricane in Florida. Should be back to business by 9/10.

In the interim, since we do not have a functional device, we are investigating renting a swather to run ahead of the combine, and collect the ragweed seeds before the combine harvests the soybeans. The most promising option is obtaining or renting a seed cleaner to remove the giant ragweed seed from the harvested beans. We cannot hold the harvest much longer.

### **October 2016:**

Soybean harvest. With the giant ragweed pressure in the field, we had to postpone soybean harvest until late October, post frost. The frost damages some of the soybeans, but kills the giant ragweed, causing its sturdy stalk to weaken and not clog the combine for bean harvest. We attempted combining beans in September pre-frost, but within 50 feet, the combine was clogged by the stem material of the giant ragweed. It was a mess to clean and the material was highly compacted.

Purchased a seed cleaner from an organic producer. This device saved the soybean crop this year. After harvesting the soybeans, the percentage of ragweed seed in the soybeans was 50%. This grain is completely unmarketable. Additionally, giant ragweed seed holds moisture and will rot any grain crop it is stored within unless proper ventilation is available. We do not have a grain dryer, only a fan, so the giant ragweed seed in the organic soybean harvest was really detrimental.

The seed cleaner removed 90% of the giant ragweed seed from the harvested soybeans. We sent the giant ragweed seed away for testing to learn more about its composition.

### **November 2016:**

Pictures of hydraulic drive assembly, below. Finishing hydraulic drive for mower, see pictures. I had to rebuild bearing housing and nine tooth drive assembly. The shaft is on lath I am getting ready to cut Groove for spring clip then I have to press assembly together. I rebuilt rear tail wheel -- see pictures -- and as you can see without rear weight I am at 720 lbs. I am working on installing lift cylinder and I will weigh front when I elevate machine and see how machine balances out.



11/3/16:

Progress update.

Device taking shape. Seat added and cutter unit out front is fully functional with hydraulic lift.



**11/22/16:**

I had to get larger hydraulic valve (NEW) because old valve could not handle the flow also linkage was not appropriate for our application, picture enclosed of new design. In first picture you can see the power beyond orifice (opening) and it is much larger than old control valve orifice, also compare to new valve same size orifice. I have a couple of hoses that may need to be replace also I am installing mower pump control this week.



### **Results so far**

The project we knew would be purely investigative since no device exists in its existing form to collect ragweed seed and remove the thick stem of the giant ragweed plant that extends past the soybean canopy. It has taken a significant amount of time to adjust, readjust, and make provisions for safety while designing the device.

We've had some notable setbacks on the timeline- all a result of being human. The engineer had a month long stay with his son in Europe, and a month off in 2016 for hip replacement surgery that was much needed. He is currently in Florida attending to his mother whose house was damaged by Hurricane Hermine.

As of today, 9/8/16: we have learned from nutrient tests that giant ragweed accumulates a lot of moisture and micronutrients from the soil. The stem actually serves symbiotic to the soybeans, supports the growth of soybean stalks. But, the giant ragweed remains more of a noxious, invasive weed since its broad leaves and bulky structure compete for sunlight and nutrition. We learned that giant ragweed accumulates magnesium and calcium, and stores it.

We plan to use this data in trending ragweed emergence and the impact of giant ragweed on crop yield- points other than the obvious which is it is a massive plant that clogs combines. More, we will convey nutrient uptake and moisture uptake results to encourage growers to apply additional nutrient ratios as needed for maximum productivity during an infestation of Giant Ragweed.

### **Work Plan For 2016/2017**

For the remainder of 2016 and 2017:

- Fine tuning the structure of the device for safety and function
- feature harvest of giant ragweed seeds on youtube
- host farm tour with OEFFA Grain Growers chapter
- investigate seed rates in 2017 crops for fields that experienced harvest of giant ragweed seeds by device or by seed cleaner
- investigate options for device reproduction in more user-friendly fashion.

### **OUTREACH**

The plan to disseminate information and insights gained from constructing and using this device remain:

- Share at farm tour with OEFFA Grain growers chapter: fall post-harvest 2016 and early emergence 2017
- youtube channel
- post grant reporting and video clips onto company website

Anticipated reach at farm tour: 55

Anticipated reach on youtube and website: 300-500